

## 10.0 MITIGATION MEASURES & MANAGEMENT PLANS

The following section provides an overview of mitigation measures typically implemented with development and recommended for consideration in future development applications within the PSA and the Stage 2 Lands.

### 10.1 EROSION AND SEDIMENT CONTROL PLAN

Erosion and sediment controls are required to minimize sediment loadings to downstream watercourses. Sediment loading critical periods are the highest during construction as well as post construction before vegetative cover on graded areas is established. Direction of runoff to temporary SWM facilities will minimize sediment loading to watercourses during construction. The key to proper sediment removal is the regular maintenance of temporary SWM facilities, especially after major rainfall events.

Erosion and sediment controls shall be in conformance with applicable policies and guidelines within the City of Cambridge, Township of Woolwich, GRCA and the Region of Waterloo, as appropriate.

Some of the erosion and sediment control measures that should be implemented are:

- Silt fencing
- Sediment traps or temporary retention ponds
- Seeding of topsoil stock piles
- Isolated and controlled stripping of development lands
- Vegetation screens
- Interceptor swales
- Filtering mediums at inlets or strategic locations
- Street cleaning programs during housing construction
- Schedule of maintenance programs
- Dust suppressants for wind erosion

Through the abatement of erosion and soil loss within a development, negative environmental effects and concern are drastically reduced both on-site and downstream of the development. The final detailed control measures chosen by the developer shall be shown on the erosion and sediment control plan and will form part of the detailed engineering design drawings.

### 10.2 STORMWATER MANAGEMENT STRATEGY

Stormwater management is a key component to the overall East Side Lands Management Strategy. Based on preliminary assessments the proposed developable areas within the Stage 2 lands are listed below. Note that these areas may be refined through future reviews.

- Fifty-five hectares of developable north of the proposed Ottawa Street extension. This includes a smaller area located west of Woolwich Street S and north of the proposed Ottawa Street in the vicinity of the Grand River. The remaining development is bounded by the proposed Ottawa Street to south, Fountain Street N to the east, the CPR railway to the north, and existing residential development to the west. The majority of this area is part of the Breslau Drain watershed with the following exceptions:
  - the smaller development area drains directly to the Grand River
  - the northern portion of the larger development drains northerly to (state watercourse)
- One hundred and fifteen hectares of developable land between the Grand River and Speedsville Road. The majority of this area is located in the Randall Drain watershed with the following exceptions:
  - the very southwest corner portion of the property drains to a small watercourse which flows directly to the Grand River
  - a small portion of the southeast area drains to Middle Creek

The increased impervious area associated with proposed development has the potential to increase downstream erosion potential and flood risk, and adversely affect the water quality and aquatic habitat of the receiving watercourses. The identification of appropriate stormwater management objectives and criteria and the integration of appropriate stormwater management mitigation measures into a comprehensive strategy are critical to the protection of the water resources of the East Side lands. The Master Drainage Plan will provide design of stormwater management facilities to ensure that these objectives and criteria are met.

This section discusses the current policy framework with respect to storm water management, establishes the storm water management objectives and criteria for the proposed developments, and presents general stormwater management recommendations for the proposed development in the Stage 2 lands.

### 10.2.1 CURRENT POLICY FRAMEWORK

At a minimum, stormwater management plans for the development of the Stage 2 lands shall be developed in conformance with the following:

- City of Cambridge Stormwater Management Master Plan (2011)
- City of Cambridge Stormwater Management Policies and Guidelines (2011)
- Stormwater Planning and Design Guide (MOE, 2003)
- Grand River Conservation Authority Policies (Ontario Regulation 150/06)

#### 10.2.1.1 CITY OF CAMBRIDGE STORMWATER MANAGEMENT MASTER PLAN

This document is a City-Wide Stormwater Management Master Plan, which evaluates existing infrastructure and policies, identifies deficiencies and provides an implementation plan, capital

planning estimates and funding mechanisms on a long-term sustainable program and policy for the management of stormwater in Cambridge.

### 10.2.1.2 CITY OF CAMBRIDGE STORMWATER MANAGEMENT POLICIES AND GUIDELINES

The City of Cambridge Stormwater Management Policies and Guidelines are intended to assist the development industry and City staff with the technical and aesthetic design of stormwater management systems in the City of Cambridge. They address the following:

- Stormwater Management Objectives
- Stormwater Management Guidelines and Policies addressing:
  - Major and Minor Drainage Systems
  - Infiltration Facilities
  - Erosion and Sediment Controls
  - Implementation of Stormwater Management Plans and
  - Maintenance of Stormwater Management Facilities

### 10.2.1.3 MOECC MANUAL

The MOECC (formerly MOE) Manual provides extensive stormwater management planning and design guidance, including guidelines for establishing stormwater management objectives, methods for assessing the potential impacts of development, and approaches to establishing the corresponding mitigation measures. The MOECC advocates utilizing a hierarchical / treatment train approach in the development of stormwater management plans. Stormwater management measures are grouped under the following headings in order of preferred application:

- Lot Level Techniques, Source Controls and Alternative Development Standards (e.g. Low Impact Development)
- Transport or Conveyance Controls
- End-of-Pipe Controls

The preference is that all stormwater management targets are met with lot-level or source controls, including alternative development standards such as developments that limit the amount of impervious area. The types of measures within this group and their wide distribution throughout a development provide the opportunity to closely match the pre-development hydrologic cycle. However, there are often constraints to locating enough of these types of controls. This creates the need for conveyance or end-of-pipe controls. Thus, stormwater management plans frequently consist of measures from all three groups that collectively form a “treatment train”.

In terms of water quality protection, the MOECC Manual identifies three levels of protection. These levels are based on the percent removal of the suspended solids from stormwater runoff

by a particular stormwater management measure or a number of measures in series (“treatment train”). The levels of protection include the following:

*Enhanced* protection corresponds to the long-term removal of 80% of suspended solids.

*Normal* protection corresponds to the long-term removal of 70% of suspended solids.

*Basic* protection corresponds to the long-term removal of 60% of suspended solids.

#### **10.2.1.4 GRAND RIVER CONSERVATION AUTHORITY POLICIES FOR THE ADMINISTRATION OF ONTARIO REGULATION 150/06**

The Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses (Ontario Regulation 150/06), is a regulation issued under the Conservation Authorities Act, R.S.O. 1990. Through this, GRCA has the authority to regulate activities in natural and hazardous areas (e.g., areas in and near rivers, streams, floodplains, wetlands, slopes and shorelines). The GRCA policies for the administration of Ontario Regulation 150/06 are outlined in *Policies for the Administration of the Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation* (GRCA 2015).

Section 8.1 of Ontario Regulation 150/06 River or Stream Valleys - Riverine Flooding Hazards speaks to specific requirements in the identification of Flood Hazard areas and areas regulated by the Conservation Authority (*Regulated Areas*). Specifically, it speaks to the requirements for identifying the Regulatory Flood limit under conditions with sufficient modelling and insufficient modelling to ensure appropriate identification of hazards.

Sections 8.4.14 and 8.4.15 of GRCA's consolidated policies document provides specific guidance for the application of policies for wetlands within their jurisdiction

#### **10.2.1.5 OTHER PROVINCIAL, REGIONAL AND MUNICIPAL POLICIES**

##### **PROVINCIAL POLICY STATEMENT (2014)**

With respect to stormwater planning, design and safety, Section 1.6.6.7 states that “*Planning for stormwater management shall:*

- minimize, or, where possible, prevent increases in contaminant loads;
- minimize changes in water balance and erosion;
- not increase risks to human health and safety and property damage;
- maximize the extent and function of vegetative and pervious surfaces; and
- promote stormwater management best practices, including stormwater attenuation and re-use, and low impact development.”

### TECHNICAL GUIDE – RIVER & STREAMS SYSTEMS: EROSION HAZARD LIMIT

This technical guide, published by the Ministry of Natural Resources and Forestry Water Resources Section (2002), provides guidance on the provincial policies, standards, assessment practices and design for flooding and erosion control within river and stream systems in Ontario. This guidance document is a primary reference and guiding document for works associated with floodplain and hydraulic assessments and fluvial geomorphological assessments of watercourses within the Project Study Area.

#### REGION OF WATERLOO OFFICIAL PLAN (2015)

##### NATURAL HAZARDS

Natural hazards (i.e. *hazard lands*) are identified by the Grand River Conservation Authority and reflected in the ROP through appropriate land use designations. Regulations for any development or site alteration within hazard lands are subject to the policies and guidelines of the Grand River Conservation Authority through Ontario Regulation 150/06.

##### SOURCE WATER PROTECTION

Section 8 of the ROP addresses source water protection within the regional context. This section contains policies for the protection and conservation of the Region's drinking-water resources. The policies will be carried out by managing land use activities within designated Source Water Protection Areas. The Source Water Protection Areas designated in this Plan include: Wellhead Protection Sensitivity Areas; wells that obtain their water from Groundwater Under the Direct Influence of surface water (GUDI wells); Surface Water Intake Protection Zones; and Regional Recharge Areas.

#### CITY OF CAMBRIDGE OFFICIAL PLAN (2012)

The stormwater management policies within the City of Cambridge Official Plan are consistent with the Region of Waterloo policies. The City encourages the use of innovative low impact development design and technologies in new development and redevelopment in addition to the required stormwater management quality and quantity facilities.

Natural Hazard policies (floodplain mapping) are consistent with the GRCA policies.

Section 3.B.3 states the goals of stormwater management, which are to maintain the natural hydrologic cycle, prevent an increased risk of flooding, prevent undesirable stream erosion, and protect water quality. MESP, master drainage plans or subwatershed studies are to provide guidance for implementation of the City of Cambridge Stormwater Management Policies and Guidelines.

Section 3.B.6.11 D identifies major floodplains as approved by GRCA and One-Zone and Two-Zone Floodplain Policy Areas.

TOWNSHIP OF WOOLWICH OFFICIAL PLAN (2007)

The Township requires management of stormwater runoff from urban and rural areas and discharge from municipal drains, tile drains and joint farm drains to reduce the possibility of downstream flooding or flooding of adjacent lands, and that the discharge of stormwater into existing watercourses, streams or rivers will not add substantially to the pollution or channel degradation of those watercourses.

### 10.2.2 STORMWATER MANAGEMENT OBJECTIVES

Based on the prevailing **policy framework** and an understanding of the **issues** and **opportunities** related to stormwater management, the following general stormwater management objectives have been established for development in the Stage 2 lands:

- Maintain or restore surface water quality and quantity to a level that maintains ecological integrity and supports appropriate uses.
- Maintain and enhance, where possible, the volume of groundwater and stream baseflow rates and the quality of groundwater to levels that ensure adequate supply for desired uses.
- Maintain and enhance, where possible, baseflow volumes and rates in streams to levels that sustain or enhance existing aquatic habitat and support other appropriate uses.
- Maintain and enhance, where possible, the water balance of wetlands.
- Preserve the existing overall surface drainage patterns (i.e. avoid redirecting flows from one basin to another)
- Maintain existing flow regimes in watercourses that are to be maintained within the development and in watercourses downstream of the development to the extent that it is feasible.
- Reduce or maintain existing risk of flooding where possible.
- Reduce or maintain existing erosion potential of the receiving watercourses.
- Minimize the risk associated with contaminant spills within the development.
- Minimize sediment loading to receiving waters from construction activities.
- Maintain or enhance the thermal regime of streams.
- Minimize changes to natural stream channel forming processes and erosion due to land use change.
- Encourage on-site infiltration of stormwater where conditions permit in order to maintain or enhance baseflow in receiving waters.
- Address existing and potential sources of pollution by implementing policies and standards as established by the Province or other organizations having jurisdiction.

### 10.2.3 STORMWATER MANAGEMENT CRITERIA

Stormwater management criteria have been established based on the **current policy framework** and understanding of the current **stormwater issues and opportunities** for the study area. Specific criteria have been established to address the following:

- Water Quantity Control
- Water Quality Control
- Erosion Control
- Maintenance of Baseflow (Infiltration)

#### 10.2.3.1 WATER QUANTITY

The criteria for flood control include control of post-development peak flows to pre-development levels for all areas that will discharge to all watercourses in the study area, including the Breslau Drain and Randall Drain and their tributaries. Under future conditions, there should be no increase in flood flow rates for events up to the 100 year storm and no increase in flood risk associated with the Regional Storm.

The flood control criteria were established to maintain or reduce the existing flood risks for all watercourses. Under existing conditions the area of highest flood risk for the Breslau Drain is located immediately upstream of Woolwich Street. For the Randall Drain the high flood risk area is located at the very downstream reach at Riverbank Drive. The Riverbank Drive culvert was replaced recently. However, the new culvert was not upsized in order to not increase flood impacts on the downstream property owner.

#### 10.2.3.2 WATER QUALITY

The recommended storm water quality criterion for the Stage 2 development lands is an Enhanced Level of Protection as defined in the 2003 MOECC Manual, thus reducing the average long term annual load of suspended sediment by 80% or better. The Enhanced Level of Protection was selected to protect the existing flow regime, which contains a significant groundwater flow.

By employing the Enhanced Level of Protection, the quality of post-development discharge to downstream watercourses in some areas (development in currently cultivated lands) is expected to constitute an improvement over existing conditions, since the current agricultural land use contributes sediment and pollutants (i.e. fertilizer).

Also, under future conditions use of designated setbacks (to be enhanced as vegetated buffers) along the watercourses would further increase stormwater treatment (e.g. through increased infiltration and reduced erosion).

**SALT MANAGEMENT PLAN**

Salt Management Plans should be prepared for the development lands to protect the downstream environment.

Snow and ice conditions on road systems, parking lots and sidewalks have a dramatic impact on public safety, road capacity, travel times and economic costs. Road salts are entering the environment in large amounts and are posing a risk to plants, animals, birds, fish, lake and stream ecosystems and groundwater.

Winter maintenance operations, both private and public, should strive to reduce the effects of the accumulated snow and ice while maintaining user safety. The City should also encourage owners of existing and proposed retail and commercial businesses in the study area to implement a viable strategy to reduce potential parking lot road salt. Salt reduction can be achieved by adopting salt best management practices and using new technologies to ensure its most effective use.

**10.2.3.3 EROSION CONTROL**

The purpose of erosion control is to ensure that the existing erosion potential in watercourses downstream of the proposed development is not increased, or reduced if possible in areas with known erosion concerns. The results of the continuous hydrologic modelling will establish the erosion thresholds for various locations within the Breslau and Randall Drain which should not be exceeded.

Low Impact Development (LID) measures and extended detention wet ponds can be designed to augment baseflows to downstream watercourses. Extended duration of discharge from the extended detention ponds should be considered for watercourse reaches with low erosion thresholds.

The erosion thresholds and water balance for Breslau and Randall Drains will be presented in the Master Drainage Plan. The Master Drainage Plan will also demonstrate how baseflows should be augmented through implementation of LID measures and SWM facilities (i.e. extended discharge duration) to ensure that the erosion thresholds are not exceeded beyond existing conditions and the existing conditions water balance is maintained.

**10.2.3.4 MAINTENANCE OF INFILTRATION AND BASEFLOW**

One of the key objectives of the stormwater management strategy is to maintain the existing water balance to the extent possible. An increase in impervious areas associated with the proposed developments will decrease infiltration. Therefore, measures to promote infiltration should be identified to offset the infiltration loss.

The existing soils within the study area and proposed development lands have high infiltration capabilities. Therefore, application of Low Impact Development Best Management Practice (BMP) measures is strongly recommended for future development. The typical LIDs would

include treatment of clean runoff in a wide range of applications that would increase infiltration and augment post-development baseflows including:

- Roof leader discharge to ponding areas (e.g. infiltration bioswales, rain gardens and depressions), roof leader discharge to soakaway pits, pervious driveways, and grassed areas with increased topsoil depths. However, since most of these facilities would be provided on private lands, maintenance of the BMPs becomes a consideration.
- Infiltration galleries, bioswales, infiltration trenches, pervious pavement located within public lands (e.g. rights-of-way or easements).

Furthermore, use of infiltration methods should consider the existing wellhead protection program implemented for the study area. LID measures should be designed and implemented to ensure no negative impacts to the existing wells.

In particular, maintenance of infiltration and baseflow will need to consider maintaining the hydroperiod of the Kossuth Wetland Complex. This wetland complex is largely surrounded by Stage 2 lands and the presence of wellhead protection areas could limit infiltration from a source water protection standpoint

All proposed infiltration-based LID controls must reduce the average long term annual load of suspended solids by 80% or better. The target water quality volume for LID controls is the 25 mm event.

#### 10.2.4 RECOMMENDED STORMWATER MANAGEMENT BMP'S FOR STAGE 2 LANDS

Through the above assessments of the existing stormwater management issues and opportunities, the presented stormwater criteria for the Stage 2 lands and how these criteria could be achieved, it is apparent that the following SWM measures are required for future development in the Stage 2 lands:

- Low Impact Development measures for water quality control and maintenance of baseflows, (**Source Controls BMPs**). Measures such as roof leader discharge to soakaway pits, rain barrels, rain gardens, grassed areas with increased topsoil depth, bioswales, pervious driveways and pavement, seepage trenches and other could be considered.
- Hybrid wetlands to achieve flood control targets, but also to provide water quality and erosion control. (**End of Pipe Conveyance BMPs**). Hybrid wetlands are preferred over extended detention wet ponds, which are preferred over dry ponds. Extended detention wet ponds can be problematic in that it is often difficult for vegetation to establish if the water levels remain too high for extended periods. A lack of shading can lead to thermal loading and increased turbidity in the receiving waterbody. Open water also attracts geese and other waterfowl, which can lead to additional water quality concerns.
- SWM conveyance measures such as grassed swales to service areas (**Conveyance Controls BMPs**). These measures can be adopted for areas which cannot be graded to SWM ponds, but also to provide runoff infiltration and distributed inflow to receiving watercourses (increase number of inflows as compared to a single community pond).

Infiltration galleries on public land following pre-treatment with oil/grit separators can also be utilized.

Implementation of the recommended BMPs should consider the following:

- Any of the above recommended BMPs, particularly the LID BMPs should be implemented in a manner that will not negatively impact the existing wellhead protection system.
- Implementation of LIDs should be maximized on public lands where these facilities can be maintained. Use of LIDs on private lands (roof leaders, rain barrel, rain gardens, etc.) is encouraged but their efficiency is subject to addressing maintenance.
- Design of wet SWM ponds should consider the proximity to the Waterloo Airport and bird related impacts.

In addition, good municipal “housekeeping” practices including bylaws limiting pesticide use; establishing storm sewer discharge restrictions; public education and encouraging the implementation and proper maintenance of source control measures on private lands (rain barrels, bioswales) will help reduce pollutant loadings and the rate of runoff. These measures should continue to be implemented and enforced.

### **10.3 GROUNDWATER MAINTENANCE STRATEGY**

The groundwater management plan focuses on the protection of drinking water quantity and quality. The plan includes:

- Identify sensitive areas within WHPA and IPZ
- Maintain water balance by enhancing groundwater recharge
- Provide a plan to reduce the risk of threats to groundwater resources
- Preserve groundwater sensitive features and functions

Based on existing knowledge of the study area, key considerations will include:

- DNAPL use will be prohibited where the groundwater vulnerability is 2, 4 or 6 within the WHPA for municipal wells in the Randall and Breslau Drains.
- The establishment and operation of waste disposal and sewage systems will be prohibited within the WHPA where the groundwater vulnerability is equal to 8 in the Randall Drain.
- The intrinsic susceptibility of groundwater is high within areas of the Randall Drain where surficial materials consist of sand and gravel outwash.
- Portions of the Randall and Breslau Drains are each within separate WHPA for RMOW wellfields. Randall Drain downstream of the airport is within the IPZ-2 for the Hidden Valley Intake.
- The shallow aquifer across the East Side Lands consists of permeable sands and gravels with high hydraulic conductivities, and infiltration rates are expected to be high. Any developments will need to consider how to maintain the water balance.

- The water table in the shallow aquifer is expected to be very close to ground surface, particularly in the vicinity of watercourses. Development under high groundwater conditions will need to be considered where applicable.
- Maintaining the hydroperiod of the Kossuth Wetland Complex and other PSWs in the study area.

Once the technical work program for the Stage 2 Lands has been completed, additional conclusions and recommendations can be provided.

## **10.4 GREENSPACE MANAGEMENT PLAN**

The Greenspace Management Plan builds mitigation measures from previous sections (Section 10.1, 10.2 and 10.3), focusing on mitigation measures and guidelines for the protection of natural heritage features within the study area.

### **10.4.1 GENERAL MITIGATION MEASURES**

To mitigate potential impacts to natural heritage features, a number of key measures have been identified within the recommended NHS (**Figure 6-3**): retention of core areas; setbacks and buffer management (Section 6.1.1); linkages within and between core areas (Section 5.3.6); and ecological enhancements (Section 6.1.2). To supplement these, a number of mitigation measures should be considered during site-specific / scoped EIS studies in support of development applications, as discussed below. General mitigation measures for impacts identified in Section 9.2 are presented in **Table 10-1** below. Detailed mitigation plans for Erosion and Sediment Control; Stormwater Management and other specific mitigation considerations are presented in the preceding sections.

**Table 10-1 - Mitigation Measures for Anticipated Impacts within the Stage 2 Lands.**

Impact / Activity	Mitigation Measures
Fragmentation of Natural Features and Corridors	<ul style="list-style-type: none"> <li>• All significant and sensitive natural heritage features are recommended for retention and protection within the NHS.</li> <li>• Linkages have been considered (Section 5.3.6) and recommendations are provided to improve and enhance ecological connectivity within and outside of the Stage 2 Lands (e.g., enhanced corridors, wildlife passage at road crossings etc.).</li> <li>• Any future proposed road / servicing corridors and crossings will be subject to additional review (EIS, EA or other study) and consideration of potential ecological impacts.</li> <li>• Implement ecological buffers with sufficient set-backs between feature(s) and development to mitigate anticipated impacts. Buffer minimum distances are set out in Section 6.1.1. Ecological buffers may serve to enhance connectivity and reduce fragmentation where features are in close proximity.</li> </ul>
Vegetation Removal / Vegetation Protection	<ul style="list-style-type: none"> <li>• All significant and sensitive natural heritage features are recommended for retention and protection within the NHS.</li> <li>• Engage in early consultation with MNR and review agencies related to species-at-risk.</li> <li>• Assess opportunities to retain existing non-Greenland vegetation features or identify opportunities for transplant or seed salvage if / as appropriate.</li> <li>• Ensure that timing constraints are applied to avoid vegetation clearing (including grubbing) during the breeding bird season (approximately April 1st to August 31st)</li> <li>• Implement ecological buffers with sufficient set-backs between feature(s) and development to mitigate anticipated impacts. Buffer minimum distances are set out in Section 6.1.1. Ecological buffers may reduce spread of invasive species and limit 'yard creep' into features.</li> </ul>
Impacts to Wildlife Habitat	<ul style="list-style-type: none"> <li>• All significant and sensitive natural heritage features are recommended for retention and protection within the NHS.</li> <li>• Engage in early consultation with MNR and review agencies related to species-at-risk.</li> <li>• Linkages have been considered (Section 5.3.6) and recommendations are provided to improve and enhance ecological connectivity within and outside of the Stage 2 Lands (e.g., enhanced corridors, wildlife passage at road crossings etc.).</li> <li>• Ensure that timing constraints are applied to avoid vegetation clearing (including grubbing) during the breeding bird season (approximately April 1st to August 31st)</li> <li>• Implement ecological buffers with sufficient set-backs between feature(s) and development to mitigate anticipated impacts. Buffer minimum distances are set out in Section 6.1.1; consideration should be given to the feature being buffered and proposed land use to confirm recommended setback or recommend larger setbacks for land uses anticipated to have a higher potential to impact features.</li> </ul>
Site Grading Impacts	<ul style="list-style-type: none"> <li>• Setbacks and buffer management recommendations (Section 6.1.1), including guidance / restrictions for grading.</li> <li>• Implementation of approved SWM strategies (Section 10.2) and development of SWM design guidelines (future study).</li> <li>• Additional hydrogeological, slope stability and geotechnical analyses to evaluate potential impacts of changes to soil type and moisture / drainage patterns (future study).</li> <li>• Best management practices during construction: S/E Control Plan (Section 10.1); timing of works; restricted access to future buffer areas for works and materials storage.</li> </ul>
Infrastructure Planning, Construction and Maintenance	<ul style="list-style-type: none"> <li>• Evaluation of road / trail / infrastructure alignments (future study), with the objectives of avoiding sensitive areas where possible; reducing the disturbance footprint; and considering alternate construction techniques (e.g., directional boring) and design measures (e.g., cut-off collars to re-direct groundwater flow), as appropriate.</li> <li>• Implementation of E/S control plans, spills management plans and other best management practices during construction and maintenance activities.</li> </ul>

**SUBWATERSHED STUDY REPORT (SECOND DRAFT)**

EAST SIDE LANDS (STAGE 2) MESP & SECONDARY PLAN

Impact / Activity	Mitigation Measures
Stormwater Discharge and Management	<ul style="list-style-type: none"> <li>• Implementation of an agency-approved stormwater management strategy (see Section 10.2) that considers all the elements discussed below, in addition to any refinements through future study at the site plan / subdivision plan stage.</li> <li>• Setbacks and buffer management recommendations (Section 6.1.1), including guidance / restrictions for grading, S/E control, plantings (for increased shading, where identified) – as supplemental features of the SWM strategy.</li> <li>• Preparation of a Salt Management Plan to reduce salt application (with future development applications).</li> <li>• Stewardship measures to reduce potential for surface water contamination.</li> </ul>
Construction and Associated Works	<ul style="list-style-type: none"> <li>• Implementation of development setbacks and buffer management measures (Section 6.1.1).</li> <li>• Implementation of linkage and enhancement measures (Section 6.1.2) to improve wildlife movement potential / plant propagule exchange and enhance existing natural features and functions.</li> <li>• Implementation of E/S control plans (Section 10.1), spills management plans (Section 10.4.5) and other best management practices during construction and maintenance activities.</li> <li>• Implementation of SWM strategy (Section 10.2), including maintenance of water balance.</li> <li>• Consideration of 'bird-friendly' building design guidelines, where appropriate (such as building heights, use of glass treatments to minimize/avoid bird collisions).</li> </ul>
Human Occupancy and Indirect Effects	<ul style="list-style-type: none"> <li>• Setbacks and buffer management (Section 6.1.1), particularly implementation of 'exclusion' or 'boundary treatment' measures such as permanent fencing and/or dense plantings.</li> <li>• Adherence to municipal guidance / legislation (e.g., pesticide application by-law). Note that conversion from active croplands to urban will greatly reduce levels of pesticide and nutrients to adjacent natural areas.</li> <li>• Trails (Section 10.4.4). Identification of well-marked and maintained trails in ecologically suitable areas adjacent to or within natural areas (subject to future impact review) will greatly reduce potential for informal trail creation.</li> <li>• Signage and stewardship (Section 10.4.6), to delineate natural areas / trail locations and educate residents about natural heritage features and functions (e.g., interpretive signage, homeowner brochures).</li> <li>• Biological monitoring (Section 11) to evaluate potential impacts and identify appropriate responses</li> </ul>
Groundwater Resources	<ul style="list-style-type: none"> <li>• Adhere to appropriate groundwater policy categories for the vulnerability score of the development area (Section 6.1.3)</li> <li>• Implementation of E/S control plans (Section 10.1), spills management plans (Section 10.4.4) and other best management practices during construction and maintenance activities.</li> <li>• Setbacks and buffer management (Section 6.1.1), particularly implementation of buffers for sensitive features with potential groundwater connections or infiltration opportunities.</li> <li>• Implementation of SWM strategy (Section 10.2), including maintenance of water balance.</li> </ul>

**10.4.2 THERMAL IMPACT MITIGATION**

The thermal analysis and fish species assemblage within Randall and Breslau Drain suggest a coolwater thermal regime within both of these watercourses. As such, it is recommended that both be managed as a coolwater system. Although two sites within Randall Drain measured predominantly warmwater characteristics (RD\_LON and RD\_TRI), this may be a result of increased solar inputs resulting from reduced shading upstream of these stations and / or an increase in overland drainage. A 20 m vegetated buffer and appropriate stormwater management strategies is recommended for all coolwater reaches within these watercourses and include vegetation that can provide shading to exposed reaches. A combination of a 20 m vegetated buffer and potential opportunities for stream restoration using natural channel design principles should be considered for the reaches upstream of RD\_LON (between Lonsdale Road and Menno Street) and RD\_TRI (south of the north-south runway) to mitigate the warmwater characteristics measured at these stations if opportunities become available to do so (e.g. through a development application).

**10.4.3 TEMPORARY AND PERMANENT FENCING**

Temporary vegetation protection fencing (which can often be combined with E&S fencing) is recommended to prevent damage to adjacent natural areas during construction. Permanent fencing is recommended at development – natural area interfaces to prevent uncontrolled access and rear lot ‘spreading’ into these sensitive areas. The need for, and location of, fencing will be to the satisfaction of the review agencies.

**10.4.4 TRAILS**

In general, locating and managing trails needs to strike a balance between providing recreational and nature-viewing opportunities for residents while protecting natural features. The location of trails will be detailed through future planning studies. It is recommended that trails not parallel long distances adjacent to core areas, however well-planned, continuous and environmentally planned routes could be considered in locations. Shorter sections or focused loops with defined viewing access points are generally preferred. This will minimize potential impacts associated with pedestrian use in close proximity to habitats for sensitive taxa (e.g., forest birds) and allow wildlife to become accustomed to pedestrian presence in specific areas such as viewing platforms. In addition, visual screening (e.g., dense plantings) may be beneficial in some areas to reduce potential impacts to sensitive taxa – pending future EIS or similar study review. Some general principles for the siting of trails includes:

- Trails are generally not supported through any of the sensitive core areas (i.e., PSW wetlands, groundwater seepage zones) or identified habitats of Regionally or Provincially significant species unless an impact assessment in an EIS or similar study demonstrates ecological viability.
- Pending assessment in a future EIS, trails may be considered in the outer portion of buffer areas for PSWs and other Core Environmental Features in accordance with this study and to the satisfaction of review agencies.

Additional guidance on design details should be provided in EIS studies (e.g., lighting, plantings, signage, trail materials, consideration of seasonal closures, etc.).

#### **10.4.5 SPILLS MANAGEMENT AND BEST MANAGEMENT PRACTICES (BMPs)**

*Spills Management Plans* should be prepared prior to grading and other *Best Management Practices* (BMPs) should be used during-construction to reduce potential for contamination of groundwater, receiving watercourses and adjacent vegetation. These include, for example, guidelines for heavy equipment use, which reduce potential for damage to natural areas (e.g., stream disturbance, mechanical damage to trees, soils compaction etc.).

#### **10.4.6 STEWARDSHIP**

Maintaining natural areas adjacent to residential and employment land development provides opportunities for passive recreation but also requires stewardship by the public / land owners to ensure long-term ecological viability. Public awareness of the need for such stewardship is critical and environmental education is an important tool in achieving this objective. Two key mechanisms should be considered, with additional detail provided in EIS studies:

##### **10.4.6.1 HOMEOWNER BROCHURE**

The purpose of the brochure is to inform residents living in close proximity to sensitive environmental features about how they can be responsible stewards of these natural resources. Topics to address include: proper handling of yard waste and composting; potential impacts and control of fertilizers and herbicides / pesticides, de-icing salts, driveway and automotive cleaning residues and disposal of toxic substances in the storm sewer system; protection of soil and vegetation in the natural areas; explanation of the importance of saplings and native ground flora; pet implications and control; and invasive plant spread from yards. It is recommended that the brochure be provided with the purchase documents, and made available at the sales trailer and at the City. The brochure should be part of the property sale documentation as well, to ensure that next generation purchasers are informed about environmental stewardship. Effectiveness of homeowner brochures is focused on the first home owner; environmental stewardship information is provided on City's website for all residents living near natural heritage features.

Pending confirmation of the land use concept, homeowner brochure's may not be applicable within the Stage 2 Lands; however opportunities for stewardship through employment land uses may warrant a similar approach to inform landowners and 'land users' associated with those properties.

##### **10.4.6.2 SIGNAGE**

Signage identifying the presence of sensitive natural areas is recommended at regular intervals along Core Environmental Feature limits to the satisfaction of review agencies where adjacent land uses may not be compatible (e.g. boundary between residential / commercial land use and a natural area).

## 10.5 IMPACT AND MITIGATION SUMMARY

In this section, we have discussed potential impacts to natural heritage features and functions within the PSA and Stage 2 Lands, as well as impacts specific to the Stage 2 Lands as a result of proposed urban development. It is important to re-iterate that many of the potential impacts have already been experienced in natural areas to varying degrees, based on the long history of agricultural use and urbanization in the general area over its history (agriculture) and the past several decades (urbanization). These include: fragmentation (via roads and monocultural croplands); loss of terrestrial and wetland habitat (through historical agricultural clearing); woodland disturbances (abiotic edge effects, cutting, trails, uncontrolled recreational use); indirect impacts from roads and traffic (e.g., noise, light, saltspray, roadkill); and soil erosion / sedimentation of creeks and wetlands (from typical farm practices).

To mitigate potential impacts across the PSA, a number of key measures have been identified within the recommended NHS (**Figure 6-3**): retention of core areas; setbacks and buffer management (Section 6.1.1); linkages within and between core areas (Section 5.3.6); and ecological enhancements (Section 6.1.2). To supplement these, a suite of mitigation measures have been discussed in Section 10 and these should be considered during site-specific EIS studies in support of development applications.