

**Enfield Water Transmission Line
Enfield, Nova Scotia**

WETLAND ALTERATION APPLICATION

Prepared for:
Eastpoint Engineering

Prepared by:



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EXECUTIVE SUMMARY

The Municipality of East Hants is proposing to install a water transmission line, with associated access road, within the community of Enfield, Nova Scotia (Figure 1, Appendix A). The proposed activities are located between Highway 102 and Highway 2 within Enfield (Figure 2, Appendix A). The proposed activities are planned to start in the summer of 2017.

As part of the planning process associated with the proposed activities, in summer 2016, on behalf of Eastpoint Engineering, McCallum Environmental (MEL) completed wetland delineation and functional assessment in land adjacent to the proposed activities (known as the Study Area), to better understand potential environmental constraints that may affect project design, and to collect pertinent information required for the submission of a wetland alteration application. The following tasks (known as the Study) were completed as part of this scope of work:

1. Wetland delineation and functional assessment;
2. Watercourse identification; and
3. Confirm the presence/absence of rare and species-at-risk.

The study resulted in the identification of five wetlands within the Study Area, of which three are proposed for alteration.

The proposed wetland alteration includes partial alteration within three wetlands (Wetland 2, 4 and 5), for the purposes of trench excavation and water line installation (WL's 2 and 5) and water line installation and access road construction (WL4). The impact areas associated with the alteration of wetlands requiring approval is; Wetland 2 (WL2): 2,634m² Wetland 4 (WL4): 269m² and Wetland 5: 960m².

The objective of this application is to provide the required supporting information as required by the Nova Scotia Wetland Conservation Policy 2011, for approval to alter wetland habitat. In support of this process, the following information is included in this report:

- Desktop review analysis including wetland inventories and species at risk review;
- Wetland delineation methodology and results;
- Watershed evaluation;
- Wetland characteristics;
- Wetland functional assessment results;
- Proposed post construction wetland monitoring; and
- Proposed wetland compensation methods.

Functional assessment for Wetlands 2, 4 and 5 resulted in the identification of two significant wetland functions within all wetlands.

In line with the Nova Scotia Wetland Assessment Method (NOVA WET Version 3.0 September 2011) functional assessment tool, due to their location within the Enfield Tertiary Watershed and the proportion of wetland area within that watershed, both wetlands have been identified to contribute highly to floodwater detention (i.e. <10% wetland cover in watershed). In addition, ACCDC and the NSE

Significant Habitat database has confirmed Federal and Provincial species of concern near the Study Area, although none were identified during the field functional assessment evaluations.

The proponent is seeking approval to alter a total area of 0.39 hectares/3,863 m² of wetland habitat. As per discussions between the Proponent and NSE, the Proponent will procure the services of a wetland restoration specialist to compensate for the wetland loss associated with the activities discussed in this application.

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1.0 INTRODUCTION

The Municipality of East Hants is proposing to install a water transmission line, with associated access road, within the community of Enfield, Nova Scotia (Figure 1, Appendix A). The proposed activities are located between Highway 102 and Highway 2 within Enfield (Figure 2, Appendix A). The proposed activities are planned to start in the summer of 2017.

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- Wetland delineation methodology and results;
- Watershed evaluation;
- Wetland characteristics;
- Wetland functional assessment results;
- Proposed post construction wetland monitoring; and
- Proposed wetland compensation methods.

Figures 1 and 3 (Appendix A) present the site location and Study Area respectively.

1.1 Proponent Information

The proponent contact information is summarized in Table 1.

Table 1: Proponent Contact Information

Name of Proponent	Derek Normanton (Project Engineer) Municipality of East Hants
Mailing/Civic Address	230-15 Commerce Court Elmsdale, NS B2S 3K5 Phone: 902 883 7098 (ex 252)
Application Contact	Derek Normanton Municipality of East Hants
Phone Number	902-883-7098 Ex 252
Email Address	dnormanton@easthants.ca
Mailing Address	230-15 Commerce Court Elmsdale, NS B2S 3K5

1.2 Project Property Information

Infrastructure associated with the Project intermittently extends from land directly adjacent to the east side of Highway 102, to the north of Shubenacadie River and active railway corridor, to undeveloped land adjacent to Highway 102 which adjoins Hemlock Drive, Enfield (Figure 3, Appendix A). The Project was divided into three separate portions, to create the Study Area. The Study Area comprises developed and undeveloped lands, including urban and commercially developed areas.

Property details related to the alteration of the Wetlands 2, 4 and 5 is provided in Table 2 below.

Table 2: Property Details

Wetland ID	PID	Property Owner	Civic Address
WL 2	45077203	Abdallah M. Khoury Susanne Khoury	13 Station Road Enfield Lot A
	45077211	Maria Josephine Myers	No 102 Highway Enfield Lot B
WL 2 and WL 4	45270402	Payzant Building Products Limited	264 Highway 2 Enfield Lot P-5AR2
WL 5	45364122	The Municipality of the District of East Hants	Carriage Lane Enfield Parcel GA

Landowner permissions for the Municipality of East Hants to perform the proposed wetland alterations in Wetlands 2 and 4 is provided in signed letters from the applicable landowners noted in Table 2 (also provided in Appendix B).

1.3 Project Team

A project team was assembled for the completion of this study. The team was selected based on level of proficiency in their respective roles. The team members and their individual roles are presented in Table 3.

Table 3: Project Team

Team Member	Role
Andy Walter, BSc. (Hort)	Project Manager
Ryan Gardiner, BSc. (Ecology)	Wetland Delineator, GIS, Watershed and Species at Risk Evaluator.
Tessa Giroux, B.NRS (Natural Resources)	Wetland Delineator, GIS and Species at Risk Evaluator.

Curriculum Vitae for the above mentioned team members are provided in Appendix C.

2.0 METHODOLOGY

The Study Team completed the scope of work via the completion of desktop review analysis and implementation of a field assessment.

2.1 Desktop Review

A background information review of wetlands and watercourses was completed using the Nova Scotia Topographic database (NSTDB), the Nova Scotia Department of Natural Resources (NSDNR) Wetlands database, Nova Scotia Wet Areas Mapping (WAM) database and the Tertiary Watershed database for the province. In addition, the provincial “Wetlands of Special Significance” database was reviewed as part of this process.

Aerial photographs were consulted (both current and historical) to assess for wetland and watercourse habitat. Several areas were also identified during the aerial photograph review that suggest wetlands occur. Notably, lands that exhibit a natural lack of tree cover (outside of cleared areas), especially when in close proximity to watercourses, can indicate possible wetland communities.

An assessment of wildlife, vegetation, and overall habitat was completed based on the requirements outlined in the Nova Scotia Environment (NSE) Guide to Addressing Wildlife Species and Habitat in an EA Registration Document (NSE, 2008).

For the purposes of this screening, a SAR is a species listed as endangered or threatened under provincial or federal endangered species legislation (Nova Scotia Endangered Species Act and Species at Risk Act, respectively). The development of a list of priority species for each taxonomic group was completed based on a compilation of listed species from the following sources:

1. Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the Federal Species-at Risk Act (SARA 2003). All species listed as Endangered, Threatened, or of Special Concern;
2. Nova Scotia Endangered Species Act (NSES 1999). All species listed as Endangered, Threatened, or Vulnerable; and,
3. Atlantic Canada Conservation Data Center (ACCDC 2015) S1, S2, S3 species.

This list of priority species was narrowed as follows:

1. by broad geographic area, which in the case of our Study Area, was central mainland Nova Scotia.

2. The list of priority species was then further narrowed through the identification of specific habitat requirements for each species. For example, if a listed NSESA species requires open water lake habitat, and no open water lake habitat is present inside the Study Area, this species was not carried forward to the final list of priority species for field assessments within the Study Area.

The final list of priority species used to guide the field evaluation is attached in Appendix D.

A review of Atlantic Canada Conservation Data Centre (ACCDC) findings confirms the presence of several priority species in and around the Study Area (see report in Appendix D). The ACCDC data was reviewed by all staff prior to the commencement of field work.

A review of Nova Scotia's Provincial Landscape Viewer, identified Significant Habitats (as indicated by the presence of species at risk), located in proximity to the Study Area.

2.2 Field Assessment

During the field assessment, the Study Team surveyed the Study Area to confirm presence of mapped wetlands and watercourses.

Wetlands are:

Land referred to as a marsh, swamp, fen, or bog that either periodically or permanently has water table at, near, or above the land surface or that is saturated with water, and sustains aquatic processes as indicated by the presence of poorly drained soils, hydrophytic vegetation, and biological activities adapted to wet conditions.

Watercourses are:

The bed and shore of every river, stream, lake, creek, pond, spring, lagoon or other natural body of water, and the water therein, within the jurisdiction of the Province, whether it contains water or not, and all groundwater.

Wetland delineation and watercourse identification field evaluations were completed on September 12, 2016.

Wetland boundaries were determined as described by the US Army Corps of Engineers, adapted for the Northcentral and Northeast Regions of the US (US Army Corp of Engineers, 2012) based on topography, soil and hydrology properties, and vegetation.

All watercourses encountered during the assessment were also identified, walked and general biophysical characteristics were recorded.

Wetland boundaries and watercourse routes were recorded on an SXBlue GPS receiver capable of sub 1m accuracy. The delineated wetlands were flagged with pink flagging tape. Data points (upland and wetland) were completed within the Study Area to determine wetland/upland boundaries.

Wetland functional data sheets were completed for wetlands identified in the field assessments.

3.0 LANDSCAPE CHARACTERISTICS

3.1 Geological Conditions

The Study Area sits within the White Quarry, Stewiacke, Carrolls Corner, Macumber and Gays River Formation within the Windsor Group (NSDNR 2012).

3.2 Surface Water

Results of the desktop review (in addition to field observations) indicates that water predominantly flows south/southeast via watercourses, drainage ditches and wetlands towards the Shubenacadie River.

The Study Area lies relatively close to the Shubenacadie River as such, is situated low in the tertiary watershed. Some of the water within the Study Area is sourced via culverts draining beneath Highway 102 which connects to other mapped wetlands and watercourses northeast of the highway. However, it should be noted that a portion of the water is also supplied by water run-off from the highway itself, and is drained by roadside ditching into the Study Area. Therefore, in some instances the highway resembles a watershed boundary as it has altered natural flows of water draining through the tertiary watershed.

3.3 Subregion Information

The Study Area lies within the Valley and Central Lowlands Ecoregion (600) and the Central Lowlands Ecodistricts (630), as described by Neily et al. (2005).

The Valley and Central Lowlands Ecoregion extends from along the Annapolis Valley from the southern portion of the Digby neck to Musquodoboit Valley. The ecoregion is underlain by Triassic sandstones within the Annapolis Valle and Minas Shore portions and Carboniferous shale, sandstone, gypsum and limestone underlie the lowlands.

The Central Lowlands ecodistrict encompasses Hants and Colchester counties. The ecodistrict is drained by several large rivers, all of which drain into the Bay of Fundy, with the exception of the Musquodoboit River which drains into the Atlantic Ocean.

For the most part the soils are fine textured soils comprised of loams, silt and clays and the presence of deep, reddish-brown soils are characteristic of the underlying Carboniferous rock. Approximately 1.5 % or 3,976 hectares of the ecodistrict is comprised of lakes and rivers.

The forests of the ecoregion are predominantly softwood, however on well-drained hills, pure stands of hardwood can be found. On well drained hummocks, yellow birch dominates. On the better drained sites, red spruce, white pine and hemlock dominate, whereas on imperfectly and poorly drained soils red pine and black spruce dominate.

3.4 Watershed Evaluation

The Study Area lies entirely within one tertiary watershed; the Enfield Tertiary Watershed (1DG-1P), which is discussed in this section. The Enfield Tertiary Watershed is located within the Shubenacadie River Secondary Watershed (1DG-1). The Enfield Tertiary Watershed (1DG-1P) and land use cover within the watershed is described in Table 4.

Table 4: Land Use Cover Within the Enfield Tertiary Watershed

Category	Total area (ha)	Percent of Watershed
Forested	918.66	53.5%
Open Natural Land/Old Fields	29.41	1.7%
Cropland	41.09	2.4%
Urban Development	554.29	32.3%
Roads	120.14	7.0%
Other development	15.84	0.9%
Wetlands	34.96	2.0%
Total	1717.74	100.0%

The Enfield Tertiary Watershed is 1717.74 hectares in size. Land use consists of natural and forested lands 55.2% and wetlands 2.0%. Urban, cropland, other and secondary road development account for 42.6%. The Enfield Tertiary Watershed has been evaluated to have 17.8% impervious surfaces (calculated using the paved roads land cover value [7.0%], and 33% of the urban development land cover value [10.8%]) and, therefore, watershed conditions are considered modified (5 - 20%).

The Nova Scotia Wetland Assessment Method (NOVAWET), Significant Function 2 (SF2) requires wetland cover to be assessed based on wetland cover alone (and not to include lakes and open bodies of water). Wetland cover alone accounts for only 2.0% of cover within the tertiary watershed which according to NOVAWET, suggests that wetlands contribute highly to floodwater protection within the catchment area (<10). However, wetland cover is very likely underrepresented in the NSDNR Wetland Inventory used for these calculations, due to lack of field verification.

The identified wetland area is predominantly represented by general unclassified wetland habitat (58.1%). The remaining portion of identified wetland habitat is comprised of Treed bog (41.9%).

4.0 RESULTS

4.1 Desktop Review

4.1.1 Aquatic Features

A review of the NSTDB and NSE wetland layers identified five mapped wetlands (two of which are classified as swamps and three which are classified as open water [ponds]) and three mapped watercourses within the Study Area (Figure 2, Appendix A). Field surveys verified the existence of four of the five mapped wetlands. One of the mapped watercourses were verified to exist, with the other two existing as man-made drainage ditches.

According to the provincial Wetland of Special Significance (WSS) shapefile, there are no WSS present within the Study Area.

4.1.2 Species At Risk and Species of Conservation Interest

The ACCDC identified the following records of SAR, SOCI and Special Areas within 5 km of the Study Area including:

- 5 managed areas,
- 7 records of 6 vascular flora,

- 101 records of 42 vertebrate and,
- 26 records of 9 invertebrates.

Of these identified records, the following species were identified to be present or have potential habitat within or directly adjacent to the Study Area:

- Two SAR: the Atlantic Salmon-Inner Bay of Fundy pop. (SARA Endangered); and Monarch (SARA Special Concern)
- One location sensitive SAR: Wood Turtle (SARA Threatened).
- Other Priority Species (not considered SAR) in close proximity to the Study Area;
 - American Eel (COSEWIC Threatened);
 - Striped Bass- Bay of Fundy pop. (COSEWIC Endangered), Bank Swallow (COSEWIC Threatened)
 - Pine Siskin (S2S3); and
 - Snapping Turtle (SARA Special Concern)

The Significant Habitat's that were identified within 5km of the Study Area through NS Provincial Landscape Viewer were (F. MacKinnon, NSE, personal communication, February 8 and March 7, 2017):

- Wood Turtle;
- Snapping Turtle;
- Brook Floater;
- Triangle Floaters;
- Common Loon and
- Bald Eagle.

4.1.3 Other Designated Areas

The Study Area is adjacent to the East Hants Regional Municipal Water Supply and is within 5kms of the Horne Settlement Provincial Park (PP), Shubenacadie Canal PP, Oakfield PP and the Shubenacadie I.R. 13, all of which are listed as Special Areas under the ACCDC report.

4.2 Field Assessment

The field evaluation confirmed the presence of five wetlands and one watercourse within the Study Area. In addition, four ditch drainages (not regulated features) were identified within the Study Area. Locations of watercourses and wetlands are provided on Figures 3, 3A-D (Appendix A). Representative photos are provided in Appendix E.

4.2.1 Wetlands

Wetlands 1, 2, 3 and 4, are part of the same aquatic system in that they connect with each other via surface drainage. Wetland 4 drains via a man-made ditch into Wetland 3, which then drains via a man-made ditch into Wetland 2. Wetland 2 drains into Wetland 1, which eventually drains into the Shubenacadie River beyond the southern extent of the Study Area (Figure 3, 3A-D, Appendix A). Wetland 5 acts as an isolated basin, although there is likely an outflow of water present at its southwestern extent, beyond the Study Area boundary (as indicated by the presence of a modelled Flow Accumulation Channel [FAC] on Figure 2).

A wetland characterisation table presenting wetland characteristics is provided in Appendix F. Hydrology and the water flow within the southern portion of the Study Area has been altered. Drainage ditches (altered or man-made) are present within the Study Area. Wetlands 1, 2, 3 and 4 drain via drainage ditches, from north to south towards Shubenacadie River.

The following sections provide characteristics for all five wetlands identified during the field evaluation. Descriptions have been grouped as per their water flow path classifications.

Representative photographs of Wetlands 2, 4 and 5 are provided in Appendix E.

Outflow Wetlands

One outflow wetland (Wetland 5) was identified within the Study Area. Although not directly identified in the field (as it was beyond the Study Area boundary) it is anticipated there is likely an outflow of water present at its southwestern extent, as indicated by a NSE flow accumulation channel (Figure 2). Wetland 5 is a mixed wood treed swamp located in the northern portion of the Study Area, it receives passive overland drainage and runoff from Highway 102. The wetland is surrounded by Highway 102 to its north and residential development to the south. This wetland is relatively intact despite the adjacent highway and residential areas, although there is some fill material present to the northeast of the wetland boundary currently being utilized for residential development (as identifiable on Figure 3C, Appendix A).

Water is provided to WL5 via adjacent uplands to the south and north, runoff from Highway 102 and residential development to the east. Hydrologic condition encountered at the data point located within WL5 is indicated by evidence of intermittent surface water, a high water table, saturated soils at surface and water stained leaves. Surface water is present at an average depth of 4cm covering approximately 2% of the wetland.

An evaluation for hydrophytic vegetation was completed in WL5. Vegetation is dominated by Red Maple and Black Spruce in the tree stratum and Speckled Alder and Common Winterberry in the shrub layer. Cinnamon Fern and Sensitive Fern dominate the herbaceous layer. A full list of species identified within WL5 is presented in Table 5.

Table 5: Wetland 5 Vegetation

Latin Name	Common Name	Indicator Status	Srank
<i>Abies balsamea</i>	Balsam Fir	FAC	S5
<i>Acer rubrum</i>	Red Maple	FAC	S5
<i>Alnus incana</i>	Speckled Alder	FACW	S5
<i>Betula populifolia</i>	Gray Birch	FAC	S5
<i>Calamagrostis canadensis</i>	Bluejoint Reed Grass	FACW	S4S5
<i>Carex crinita</i>	Fringed Sedge	OBL	S5
<i>Carex folliculate</i>	Long Sedge	OBL	S5
<i>Carex lurida</i>	Shallow Sedge	OBL	S5
<i>Cornus canadensis</i>	Bunchberry	FAC	S5
<i>Equisetum arvense</i>	Field Horsetail	FAC	S5

Latin Name	Common Name	Indicator Status	Srank
<i>Equisetum sylvaticum</i>	Woodland Horsetail	FAC	S5
<i>Galium palustre</i>	Common Marsh Bedstraw	FACW	S5
<i>Glyceria canadensis</i>	Canada Manna-grass	OBL	S5
<i>Juncus effusus</i>	Soft Rush	FACW	S5
<i>Larix laricina</i>	Larch	FAC	S5
<i>Oclemena nemoralis</i>	Bog Aster	OBL	S5
<i>Onoclea sensibilis</i>	Sensitive Fern	FACW	S5
<i>Osmunda cinnamomea</i>	Cinnamon Fern	FAC	S5
<i>Populus tremuloides</i>	Trembling Aspen	FAC	S5
<i>Rubus pubescens</i>	Dwarf Red Raspberry	FAC	S5
<i>Scirpus cyperinus</i>	Common Woolly Bulrush	FACW	S5
<i>Solidago canadensis</i>	Canada Goldenrod	FAC	S5
<i>Spiraea tomentosa</i>	Steeplebush	FAC	S5
<i>Typha latifolia</i>	Broad-leaved Cat-tail	OBL	S5

Throughflow Wetlands

Wetlands 1, 2, 3 and 4 are identified as throughflow wetlands, with drainage ditch inlets and outlets in each wetland.

Wetland 1 is a freshwater marsh, with a drainage ditch outlet that eventually drains southward into the Shubenacadie River. Water is provided by the drainage ditch inlet from Wetland 2. Common cattail dominates within the wetland.

The man-made drainage ditch, is approximately 1m wide and ranging from 0.25 to 0.75m deep with aquatic vegetation present. The drainage ditch comprises a low slope, so flow is slow through the ditch. Standing water and open water habitat are present in the central portion of WL1.

Wetland 2 exists as a wetland complex with freshwater marsh and conifer-treed swamp portions. Within the freshwater marsh habitat, standing water depth ranges from 30 to 50 cm covering approximately 60% of the wetland area. Whereas within the swamp habitat standing water depth (which appears to be concentrated in the eastern and central portions of the wetland) ranges from 10 to 30cm covering approximately 30% of the wetland area. Hydrologic condition encountered at the data points located within WL 2 is indicated by surface water, a high water table, saturated soils at surface, water-stained leaves, presence of aquatic fauna, thin muck present at the surface, hydrogen sulfide odor and inundation is visible on aerial imagery.

An evaluation for hydrophytic vegetation was completed in WL2. The freshwater marsh portion is dominated by Speckled Alder in the shrub layer and Broad-leaved Cattail and Common Tall Manna Grass dominate the herbaceous layer. Within the conifer-treed swamp Larch dominates the tree stratum, Larch dominates the shrub stratum and Broad-leaved Cattail and Common Tall Manna Grass dominate the herbaceous layer. A full list of species identified within WL2 is presented in Table 6.

Table 6: Wetland 2 Vegetation

Latin Name	Common Name	Indicator Status	Srank
<i>Acer rubrum</i>	Red Maple	FAC	S5
<i>Alnus incana</i>	Speckled Alder	FACW	S5
<i>Betula populifolia</i>	Gray Birch	FAC	S5
<i>Carex lurida</i>	Shallow Sedge	OBL	S5
<i>Carex scoparia</i>	Broom Sedge	FAC	S5
<i>Carex stricta</i>	Tussock's Sedge	OBL	S5
<i>Chamaedaphne calyculata</i>	Leatherleaf	OBL	S5
<i>Crataegus monogyna</i>	English Hawthorn	FACU	SNA
<i>Equisetum sylvaticum</i>	Woodland Horsetail	FAC	S5
<i>Galium palustre</i>	Common Marsh Bedstraw	FACW+	S5
<i>Glyceria canadensis</i>	Canada Manna-grass	OBL	S5
<i>Ilex verticillata</i>	Common Winterberry	FACW+	S5
<i>Impatiens capensis</i>	Spotted Jewelweed	FAC	S5
<i>Juncus effusus</i>	Soft Rush	FACW	S5
<i>Larix laricina</i>	Larch	FAC	S5
<i>Oclemena nemoralis</i>	Bog Aster	OBL	S5
<i>Onoclea sensibilis</i>	Sensitive Fern	FACW	S5
<i>Polygonum amphilbium</i>	Water Smartweed	OBL	SNR
<i>Populus tremuloides</i>	Trembling Aspen	FAC	S5
<i>Prunus virginiana</i>	Choke Cherry	FAC	S5
<i>Rosa virginiana</i>	Virginia Rose	FAC	S5
<i>Rubus pubescens</i>	Dwarf Red Raspberry	FAC	S5
<i>Scirpus cyperinus</i>	Common Woolly Bulrush	FACW	S5
<i>Solidago canadensis</i>	Canada Goldenrod	FAC	S5
<i>Spiraea tomentosa</i>	Steeplebush	FAC	S5
<i>Typha latifolia</i>	Broad-leaved Cat-tail	OBL	S5

Wetland 3 is a shrub swamp, and does not comprise standing nor open water, however surfaces are saturated throughout. Water is provided to WL 3 by the drainage ditch inlet from Wetland 4 and runoff from Highway 102. Common Cattail dominate the herbaceous stratum and Speckled Alder dominates the shrub stratum.

Wetland 4 exists within the northern extent of the southern portion of the Study Area as a mixedwood swamp with a drainage outlet and inlet. This wetland appears to receive water from a man-made drainage ditch and runoff from the adjacent residential development located to the north. Wetland 4 drains water westward into Wetland 3. Hydrologic condition encountered at the data point located within WL4 is indicated by saturated soils at surface, water stained leaves and oxidized rhizospheres on living roots. No surface water is present within Wetland 4.

An evaluation for hydrophytic vegetation was completed in WL4. The wetland exists as a mixed wood treed swamp dominated by Trembling Aspen and Paper Birch in the tree stratum and Common Winterberry in the shrub layer. Steeplebrush and Marsh Willowherb dominate the herbaceous layer. A full list of species identified within WL4 is presented in Table 7.

Table 7: Wetland 4 Vegetation

Latin Name	Common Name	Indicator Status	Srank
<i>Abies balsamea</i>	Balsam Fir	FAC	S5
<i>Acer rubrum</i>	Red Maple	FAC	S5
<i>Alnus incana</i>	Speckled Alder	FACW	S5
<i>Bidens cernua</i>	Nodding Beggar-ticks	OBL	S5
<i>Betula papyrifera</i>	Paper Birch	FACU	S5
<i>Dryopteris cristata</i>	Crested Wood Fern	FACW	S5
<i>Epilobium ciliatum</i>	Hairy Willow-herb	FAC	S5
<i>Ilex verticillata</i>	Common Winterberry	FACW+	S5
<i>Juncus effusus</i>	Soft Rush	FACW	S5
<i>Larix laricina</i>	Larch	FAC	S5
<i>Onoclea sensibilis</i>	Sensitive Fern	FACW	S5
<i>Osmunda cinnamomea</i>	Cinnamon Fern	FAC	S5
<i>Populus tremuloides</i>	Trembling Aspen	FAC	S5
<i>Prunus virginiana</i>	Choke Cherry	FAC	S5
<i>Rubus alleghaniensis</i>	Allegheny Blackberry	FACU	S5
<i>Scirpus cyperinus</i>	Common Woolly Bulrush	FACW	S5
<i>Solidago canadensis</i>	Canada Goldenrod	FAC	S5

Confirmation of the presence of hydrophytic vegetation, wetland hydrology and hydric soils was established by the completion of one data point within each wetland, and one data point in the adjacent upland. Wetland Data Sheets are provided in Appendix F.

A summary of data point results at wetland and upland locations is provided in Table 8.

Table 8: Data Point Results

Data Point	Location (UTM NAD83)	Hydric Soil Indicator	Wetland Type	Indicators of Wetland Hydrology	Hydrophytic Vegetation Present / %	Positive Test for Wetland Habitat
Wetland Point 1	457434 mE 4976223 mN	F3- Depleted Matrix	Freshwater Marsh (man-made)	Surface water, Saturated at surface, High water table,	Yes / 100%	Yes
Upland Point 1/2	457424 mE 4976242 mN	None	N/A	None	Yes / 100%	No
Wetland Point 2.1	457432 mE 4976272 mN	A2- Histic Epipedon	Freshwater Marsh (man-made) part of a wetland complex	Surface water, Saturated at surface, High water table, Inundation Visible on	Yes / 100%	Yes

Data Point	Location (UTM NAD83)	Hydric Soil Indicator	Wetland Type	Indicators of Wetland Hydrology	Hydrophytic Vegetation Present / %	Positive Test for Wetland Habitat
				Aerial Imagery, Water-stained leaves, Aquatic Fauna		
Wetland Point 2.2	457402 mE 4976793 mN	A2- Histic Epipedon A4- Hydrogen Sulfide	Conifer- treed swamp part of a wetland complex	Surface water, Saturated at surface, High water table, Water- stained leaves, Aquatic Fauna, Hydrogen Sulfide Odor, Thin Muck Surface	Yes / 100%	Yes
Wetland Point 3	457368 mE 4976909 mN	F3- Depleted Matrix	Shrub swamp	Saturated at surface, High water table	Yes / 75%	Yes
Upland Point 3/4	457407 mE 4976911 mN	None	N/A	None	Yes / 67%	No
Wetland Point 4	457430 mE 4976891 mN	A2- Histic Epipedon	Mixedwood Swamp	Saturated at surface, High water table, Water-stained leaves, Oxidized rhizospheres on living roots	Yes / 83%	Yes
Wetland Point 5	458089 mE 4978534 mN	A1- Histosol	Mixedwood Swamp	Surface water, Saturated at surface, High water table, Water-stained leaves	Yes / 100%	Yes
Upland Point 5	458100 mE 4978574 mN	None	N/A	None	Yes / 67%	No

4.2.2 Watercourses

As described above, one watercourse, labelled WC1, and four drainage ditches were identified during the field evaluation within the Study Area as indicated on Figures 3A-D (Appendix A).

WC1 is an ephemeral watercourse, and it drains into the Shubenacadie River. Within 5km of the Study Area, the Shubenacadie River has confirmed occurrences of the Atlantic Salmon-Inner Bay of Fundy pop. (SARA Endangered), American Eel (COSEWIC Threatened) and Snapping Turtle (SARA Special Concern).

Watercourses 1 (WC1) originates from a culvert beneath West Crescent Road and exists in the same location as an NSE mapped watercourse. WC1 flows southeast and extends beyond the Study Area boundary before meeting with a drainage channel and draining to the Shubenacadie River as discussed above. This mapped watercourse originates from beyond the northern Study Area boundary and is sourced from a mapped wetland on the western side of Highway 102. The watercourse is ephemeral in nature and was dry at the time of the field survey. No barriers to fish passage were observed along WC1

within the Study Area, however, the mapped watercourse has no natural connection to the Shubenacadie River due to the urban/commercial development downstream.

Drainage Features

Although not considered a regulated watercourse, a channelized drainage feature was identified in the northern Study Area. The feature originates from culverts beneath Highway 102 and is identified on NSE mapping as a watercourse. However, as per communication provided by NSE to East Hants, the feature is supplied water from anthropogenic sources (i.e. surface run-off and ditching alongside Highway 102) and does not meet the provincial criteria and categorization as a watercourse. This drainage feature has no natural connection to the Shubenacadie River due to its presumed subsurface flow beneath the urban/commercial development between the Study Area and the Shubenacadie River.

Four additional drainage features were identified across the Study Area, all of which exhibited anthropogenic ditch characteristics.

4.2.3 Species at Risk

SAR and SOCI that have been identified through review of the ACCDC report, have been identified in proximity to Study Area, and their likelihood to be present within the wetlands proposed for alteration are discussed below. All other SAR and SOCI are listed in the Priority Species List (Appendix D).

Atlantic Salmon-Inner Bay of Fundy pop. (SARA Endangered)

The freshwater habitat requirement for Atlantic Salmon- Inner Bay of Fundy pop. is clean, cool, flowing water free from chemicals and organic pollution within natural stream channels with rapid and pools. The species also require a gravelly bottom with water temperature between 15 and 25°C in the summer. This species has been observed within the 5km of the Study Area within the Shubenacadie River. However, there is no natural stream channel connectivity from the Shubenacadie River to Wetlands 2, 4 and 5, and in addition, suitable habitat to support this species is not present in wetlands or watercourses.

Wood Turtle (SARA Threatened)

The Wood Turtle requires sandy or gravelly-sandy bottoms and prefers clear meandering watercourses. They also are found within bogs, marshy pastures, beaver ponds, shrubby cover, meadows, coniferous and mixedwood forests, hay and agricultural fields and pastures. There is potential habitat for the Wood Turtle within Wetlands 2, 4 and 5.

American Eel (COSEWIC Threatened)

Preferred habitat for the American Eel includes lakes and river habitats with rock, sand and mud substrate, woody debris and submerged vegetation. The American Eel has been observed within 5km of the Study Area within the Shubenacadie River. In high water events, there is a potential for American Eel to access Wetlands 2 and 4 from the Shubenacadie River via the drainage ditch. However, habitat quality within the wetlands is low within the drainage ditch and within the wetland habitats being altered. There is no potential for the American Eel to access WL5 nor does WL5 have suitable habitat present (standing water cover is approximately 2% of the wetland area).

Striped Bass- Bay of Fundy pop. (COSEWIC Endangered)

Striped Bass requires high quality spawning and nursery habitat (high water quality) with abundant aquatic species for food. The striped bass has been observed within 5km of the Study Area within the Shubenacadie Grand Lake located approximately 2.9km west of the Study Area. There is no natural stream channel connectivity from the Shubenacadie River to Wetlands 2, 4 and 5. Standing water was not present within WL4, and minimal (less than 35% and 2%) standing water was present within WL2

and WL5, respectively. Therefore, no potential habitat including, high quality spawning and nursery habitat is present within Wetlands 2, 4 and 5.

Bank Swallow (COSEWIC Threatened)

Preferred habitat for the Bank Swallow includes areas where banks and cliffs are available. No banks or cliffs were observed within the Study Area.

Snapping Turtle (SARA Special Concern)

Preferred habitat for the Snapping Turtle includes ponds, lakes, slow-moving streams with soft mud bottoms and abundant aquatic vegetation. Snapping Turtles have been observed within 5km of the Study Area within the Shubenacadie River. However, no potential habitat, for the Snapping Turtle exists within Wetlands 2, 4 and 5, as there is no contiguous channel within the wetlands, standing water was not present within WL4 and less than 35% and 2% standing water was present within WL2 and WL5, respectively.

Brook Floater (SARA Special Concern)

Preferred habitat for the Brook Floater includes flowing rivers and creeks with stable sand or gravel substrate. No potential habitat for the Brook Floater exists within Wetlands 2, 4 and 5, there is no natural connectivity to the Shubenacadie River, and there is no flowing rivers or creeks existing within the wetland habitat.

Monarch (SARA Special Concern)

The Monarch can be found almost anywhere, however the monarch prefers areas that support milkweed species. No milkweed species were observed during field surveys.

Triangle Floater (S2S3)

Preferred habitat for the Triangle Floater includes streams and rivers with sand and gravel substrate. These habitat types do not occur within Wetlands 2, 4 and 5 and there is no natural connectivity to the Shubenacadie River.

Pine Siskin (S2S3)

Preferred habitat for the Pine Siskin is open coniferous forests, they breed in conifers in parks, cemeteries and mixedwood forests. They forage in trees, shrubs and grassy areas. Wetlands 2, 4 and 5 all provide potential foraging habitat for the Pine Siskin.

Brook Trout (S3)

Brook Trout prefers cold slow-moving water in streams and rivers with gravel substrate. These habitat types do not occur within Wetlands 2, 4 and 5 and there is no natural connectivity to the Shubenacadie River.

4.3 Functional Assessment Overview

During the field study, functional assessment (FA) analysis was completed within the wetlands proposed for alteration (WL's 2, 4 and 5) using the Nova Scotia Wetland Assessment Method (NOVA WET Version 3.0 September 2011).

NOVA WET addresses 11 specific categories by which the functional value of the wetland can be evaluated. Functions were evaluated within each category for the wetland subject to alteration during

field evaluations. The Functional Assessment forms for each of the wetlands are provided in Appendix F. Tables 9-11 provide an overview of results of the functional assessment completed for Wetlands 2, 4 and 5.

Table 9: Wetland 2: Functional Assessment Results

Individual Function	Watershed Characteristics	Wetland Characteristics	Adjacent Land Condition and Integrity	Documented Important ¹ Features	Hydrological Condition and Integrity	
Wetland Performing Functions	<ul style="list-style-type: none"> - Watershed conditions are considered modified (10-20%). - Wetland cover is estimated at 2.0% in tertiary watershed. - Wetlands contribute highly to floodwater detention. 	<ul style="list-style-type: none"> - Throughflow, via drainage ditch outlet and inlet. - Stressors present (adjacent highway infrastructure, drainage ditch, channelized watercourse, dead woody plants, garbage). - Standing water and saturated areas. - WL likely altered as part of historical highway construction. - Limited natural/forested buffer (bordered by highway infrastructure, urban development) <p><u>Medium wetland condition/integrity</u></p>	<ul style="list-style-type: none"> - Adjacent land is forested for a limited width prior to highway infrastructure and urban development (<60m). - Supports water quality (>15m vegetated buffer). - Medium wildlife quality. - Vegetation condition and diversity is medium to high. - Moderate to gentle sloping boundaries. <p><u>Medium adjacent land integrity</u></p>	<ul style="list-style-type: none"> - <u>Yes</u> - ACCDC has reported occurrences of SAR and SOCI within 5km of the wetland/project area that are federally or provincially listed. 	<ul style="list-style-type: none"> - Wetland is a throughflow (drainage ditch inlet and outlet) - Lack of surface channels present, therefore water flows through wetland via sheet flow and is hence retarded, subsequently reducing downstream flooding. - Comprises standing water/flooding and multiple other water retention indicators. - Wetland receives minor run-off from adjacent highway infrastructure and urban development. <p>Therefore, its ability to detain surface water is <u>MEDIUM</u> and its ability to maintain streamflow is <u>LOW</u>.</p>	
Significant Functions Present?	YES- SF2	NO	NO	YES – SF7	NO	
Individual Function	Water Quality	Groundwater Interactions	Shoreline Stabilization and Integrity	Plant Community	Fish and Wildlife Habitat	Community Use/Value
Wetland Performing Functions	<ul style="list-style-type: none"> - Water is predominantly sourced by overland flow from surrounding uplands and connected wetlands, and minor runoff from adjacent highway infrastructure and urban development; therefore, water quality functions are not significant. - Wetland comprises high vegetative density to perform water energy and allow settling of suspended materials. - As a result of its type (sheetflow) the wetland holds and filters surface water run-off. <p>Wetland therefore determined to provide a <u>HIGH function for contributing to downstream water quality.</u></p>	<p>WL 2 presents indications of being both a “discharge” and a “recharge” site.</p>	<p>None. Wetland does not exist in association with a watercourse, lake, pond, estuary, ocean.</p>	<ul style="list-style-type: none"> - Vegetation diversity is high. - Wetland does not include dominant non-native, or invasive species. - Vegetation has experienced some disturbance (evidence of dead plants (flooding), but presents high integrity. - No rare or endangered plant species observed. <p><u>Overall integrity/quality of plant species is MODERATE.</u></p>	<ul style="list-style-type: none"> - Barriers to wildlife to other habitats as a result of highway infrastructure and urban development. - Wetland comprises low vegetative/water interspersions. - Drainage ditch is contiguous with a Shubenacadie River and is accessible to fish. - No evidence of wildlife including birds. <p><u>Overall wildlife habitat quality is considered MODERATE.</u></p>	<p>Low-Visible from vantage points.</p>
Significant Functions Present	NO	NO	NO	NO	NO	NO

¹ These include: Wetland of Special Significance, support commercial/recreational fish/shellfish, supports species of concern (Fed/Prov), conservation/compensation agreements/activity, calcerous fen, black ash or cedar swamp, within Drinking Water Protected Area (designated watershed/wellfield), within a floodplain and upstream of or within of a populated area, Fed/Prov/Municipal area of interest.

Table 10: Wetland 4: Functional Assessment Results

Individual Function	Watershed Characteristics	Wetland Characteristics	Adjacent Land Condition and Integrity	Documented Important ¹ Features	Hydrological Condition and Integrity	
Wetland Performing Functions	<ul style="list-style-type: none"> - Watershed conditions are considered modified (10-20%). - Wetland cover is estimated at 2.0% in tertiary watershed. - Wetlands contribute highly to floodwater detention. 	<ul style="list-style-type: none"> - Outflow, via drainage ditch outlet. - Stressors present (adjacent urban development). - No standing water. - Stressors present (adjacent urban development, drainage ditch, garbage) - Limited natural/forested buffer due to urban development. <p><u>MODERATE wetland condition/integrity</u></p>	<ul style="list-style-type: none"> - Adjacent land bordered by urban development (<50m). - Supports water quality (>15m vegetated buffer). - Medium wildlife quality. - Vegetation condition and diversity is Low. - Gently sloping boundary. <p><u>LOW adjacent land integrity</u></p>	<ul style="list-style-type: none"> - <u>Yes</u> -ACCDC has reported occurrences of SAR and SOCI within 5km of the wetland/project area that are federally or provincially listed. 	<ul style="list-style-type: none"> - Wetland is an outflow (drainage ditch outlet). - Lack of surface channels present, therefore water flows through wetland via sheet flow and is hence retarded. - Wetland receives minor run-off from adjacent urban development. <p><u>Therefore, its ability to detain surface water is MEDIUM its ability to maintain streamflow is LOW.</u></p>	
Significant Functions Present?	YES- SF2	NO	NO	YES – SF7	NO	
Individual Function	Water Quality	Groundwater Interactions	Shoreline Stabilization and Integrity	Plant Community	Fish and Wildlife Habitat	Community Use/Value
Wetland Performing Functions	<ul style="list-style-type: none"> - Water is predominantly sourced by overland flow from surrounding uplands and minor runoff from urban development; therefore, water quality functions are not significant. - Wetland comprises high vegetative density to perform water energy and allow settling of suspended materials. - As a result of its type (sheetflow) the wetland holds and filters surface water run-off. <p><u>Wetland determined to provide a MEDIUM function for contributing to downstream water quality.</u></p>	<p>WL 4 presents indications of being both a “discharge” and a “recharge” site.</p>	<p>None. Wetland does not exist in association with a watercourse, lake, pond, estuary, ocean.</p>	<ul style="list-style-type: none"> - Vegetation diversity is moderate. - Wetland does not include dominant non-native, or invasive species. - Vegetation has experienced low disturbance (fenced compound), and presents moderate integrity. - No rare or endangered plant species observed. <p><u>Overall integrity/quality of plant species is MODERATE.</u></p>	<ul style="list-style-type: none"> - Barriers to wildlife to other habitats as a result of urban development. - No potential for fish or fish habitat. - No evidence of wildlife including birds. <p><u>Overall wildlife habitat quality is considered LOW.</u></p>	<p>Low-Visible from vantage points.</p>
Significant Functions Present	NO	NO	NO	NO	NO	NO

¹ These include: Wetland of Special Significance, support commercial/recreational fish/shellfish, supports species of concern (Fed/Prov), conservation/compensation agreements/activity, calcerous fen, black ash or cedar swamp, within Drinking Water Protected Area (designated watershed/wellfield), within a floodplain and upstream of or within of a populated area, Fed/Prov/Municipal area of interest

Table 11: Wetland 5: Functional Assessment Results

Individual Function	Watershed Characteristics	Wetland Characteristics	Adjacent Land Condition and Integrity	Documented Important ¹ Features	Hydrological Condition and Integrity	
Wetland Performing Functions	<ul style="list-style-type: none"> - Watershed conditions are considered modified (10-20%). - Wetland cover is estimated at 2.0% in tertiary watershed. - Wetlands contribute highly to floodwater detention. 	<ul style="list-style-type: none"> - Outflow, via drainage. - Stressors present (adjacent urban development and fill to east). - Very limited areas of standing water. - Limited natural/forested buffer due to urban development (S) and Highway 102 (N). <p><u>MODERATE wetland condition/integrity</u></p>	<ul style="list-style-type: none"> - Adjacent land bordered by urban development (<50m). - Moderately supports water quality (8-15m vegetated buffer). - Low wildlife quality. - Vegetation condition and diversity is Low. - Gently sloping boundary. <p><u>LOW adjacent land integrity</u></p>	<ul style="list-style-type: none"> - <u>Yes</u> -ACCDC has reported occurrences of SAR and SOCI within 5km of the wetland/project area that are federally or provincially listed. 	<ul style="list-style-type: none"> - Wetland is an outflow (into offsite stormwater infrastructure). - Lack of surface channels present, therefore water flows through wetland via sheet flow and is hence retarded. - Wetland receives minor run-off from adjacent urban development. <p>Therefore, its ability to detain surface water is <u>MEDIUM</u> its ability to maintain streamflow is <u>LOW</u>.</p>	
Significant Functions Present?	YES- SF2	NO	NO	YES – SF7	NO	
Individual Function	Water Quality	Groundwater Interactions	Shoreline Stabilization and Integrity	Plant Community	Fish and Wildlife Habitat	Community Use/Value
Wetland Performing Functions	<ul style="list-style-type: none"> - Water moderate water flow from urban development (residential and highway); therefore, water quality functions are moderately significant. - Wetland comprises moderate vegetative density to perform water energy and allow settling of suspended materials. - As a result of its flow type (sheetflow) the wetland holds and filters surface water run-off. <p><u>Wetland determined to provide a MEDIUM function for contributing to downstream water quality.</u></p>	<p>WL 4 presents indications of being both a “discharge” site.</p>	<p>None. Wetland does not exist in association with a watercourse, lake, pond, estuary, ocean.</p>	<ul style="list-style-type: none"> - Vegetation diversity is moderate. - Wetland does not include dominant non-native, or invasive species. - Vegetation has experienced low disturbance, and presents high integrity. - No rare or endangered plant species observed. <p><u>Overall integrity/quality of plant species is HIGH.</u></p>	<ul style="list-style-type: none"> - Barriers to wildlife to other habitats as a result of urban development. - No potential for fish or fish habitat. - No evidence of wildlife including birds. <p><u>Overall wildlife habitat quality is considered LOW.</u></p>	<p>Low-Visible from vantage points.</p>
Significant Functions Present	NO	NO	NO	NO	NO	NO

¹ These include: Wetland of Special Significance, support commercial/recreational fish/shellfish, supports species of concern (Fed/Prov), conservation/compensation agreements/activity, calcerous fen, black ash or cedar swamp, within Drinking Water Protected Area (designated watershed/wellfield), within a floodplain and upstream of or within of a populated area, Fed/Prov/Municipal area of interest

4.4 Functional Assessment Summary

The functional assessment completed for WL's 2, 4 and 5 has resulted in the following outcomes:

All three wetlands have been identified to comprise the same two critical wetland functions, those being:

- *Significant Function (SF)2: Predicted wetland cover within the tertiary watershed is <10%;*
- *SF7: There are species near, or using the wetland/project area that classify as a SAR and/or SOCI; and*

These significant functions, and the predicted association with the proposed alterations being proposed are discussed below.

4.4.1 Significant Function 2

All wetlands are likely to contribute to floodwater detention within the tertiary watershed. However, wetland area within the tertiary watershed is presumed underrepresented due to lack of field verification, and in our experience delineating beneath forested canopies in Nova Scotia over the last ten years, actual treed and shrub wetland cover within the watershed is likely to exceed the 2.0% predicted via desktop data sources.

The nature and extent of alteration (which is discussed in detail in the following sections) in addition to the wetland characteristics at the alteration location is not expected to impact the floodwater detention abilities of any of the wetlands. The footprint of the infrastructure (<12m wide), and construction methods being employed negates the potential for any impacts to floodwater detention functions. Excavation of the water line trench will be reinstated with gravel around the water line and originally excavated material and organic wetland soils, whereas the access road will comprise 4-6" rock which is suitable for maintaining any water flow that may occur. To that end, conditions within the wetlands proposed for alteration comprise no standing/flowing water likely to be interrupted by access road and water line trench construction, and hence supports the prediction that no impacts to flood detention functions will occur.

4.4.2 Significant Function 7

Although no evidence of SAR or SOCI were identified during field surveys, ACCDC and the NSE Significant Habitat database has confirmed Federal and Provincial species of concern near the Study Area). Of these species, it has been determined that there is potential habitat for the Wood Turtle, Pine Siskin and Monarch butterfly within Wetlands 2, 4 and 5. In addition, in high water events, there is a potential for American Eel to access Wetlands 2 and 4 from the Shubenacadie River via the drainage ditch. However, habitat quality within the wetlands is low within the drainage ditch, and the specific locations of Wetlands 2 and 4 which are proposed for alteration do not consist of suitable American Eel habitat (i.e., lack of standing water component). The above species are considered transient, and as such, unless they are utilizing a specific habitat for breeding purposes (which these species are not), they will relocate themselves across the landscape regularly.

5.0 PROPOSED WETLAND ALTERATION

5.1 Wetland Alteration

Construction activities are proposed to initiate in summer 2017, pending approval. Wetland alteration is required for the following:

- Installation of a sub-surface water line and associated permanent and temporary construction easements. The width of this area is 9.15m.
- One small section of access road (which also incorporates the water line) is required through WL2. The width of this area is 12m.

Collectively these areas are known as the Project footprint. Anticipated wetland impact areas and approximate footprint details within each wetland proposed for alteration are provided in Table 12.

Table 12: Wetland Alteration Areas

Wetland ID	Total Wetland Size (m ²)	Anticipated Alteration Area (m ²)	Approximate Footprint Width Through Wetland (m)
2	48,667	2,634	9.15
4	2,203	269	12
5	9,640	960	9.15

5.1.1 Construction Activities

On average, the proposed Project footprint will consist of a trench approximately 1m wide (depth varies along alignment due to subsurface conditions) which will be excavated to lay the new water line. Type 1 bedding material will be used to backfill the trench to approximately 0.8m, at which point 100-150mm clear stone will be used to backfill. Surfaces will be reinstated with wetland soils (organics) and as a result, subsurface water flows should be unaffected. The service access road will be constructed upon the water line and shall include the service road surface, and toe of slope. Coarse rock (i.e. >4-6”) will also be used as the base layer for the service access road to ensure hydrological connectivity from one side of the wetland to the other. This will prevent the back up of water on the up-gradient side of the road from occurring and maintain wetland functions. Detailed cross sections are provided in Appendix G.

5.1.2 Potential Impacts

When infilling and intersecting a portion of a wetland during road development, there is potential of alteration of flow into, through, or out of wetland habitat. These flow interruptions might result in drier conditions or deeper/more prolonged inundation in remaining wetland habitat.

Sedimentation and erosion can occur during construction activities which when exposed to surface water, can transport suspended sediments to down-gradient aquatic receptors.

Potential impacts to unaltered wetland as a result of the Project are not expected for the following reasons:

- Minimal hydrological impacts will occur: WL4 comprises a relatively dry surface regime (i.e., saturated within the growing season) and was dry at the time of survey. Wetland 5 has minimal surface water (4cm deep covering approximately 2% wetland area) and WL2 has an average depth of 15cm within approximately 35% of the wetland habitat. Areas of standing water within WL2 are located within its lower lying, eastern and central portions, with drier, saturated surfaces observed in its western extent at the location of the Project infrastructure;
- The proposed Project footprint is small (not exceeding 12 m in width [access road]);

- Coarse rock (access road) and clear stone and native soils (water line) will be used in the construction process to maintain subsurface flow of water through Project infrastructure; and
- Sediment and erosion is not expected to have downstream effects as a result of a lack of surface water in the locations of Project infrastructure. In addition, sediment and erosion controls will be installed as discussed in Section 5.1.3 to further mitigate this potential impact.

5.1.3 Mitigation

In order to maintain a similar hydroperiod across the remaining wetland habitat, and to minimize direct and indirect impacts from construction activities, some general guidelines are provided for the wetland that will be partially impacted, but preserved following project construction.

To manage erosion and sedimentation control during construction and operation, erosion control systems will be developed by the Proponent's contractor. These systems will be in place to manage runoff from the construction area, especially into remaining adjacent wetland habitat. The preferred approach is to focus on the prevention of erosion. This can be achieved by minimizing the time, slope and area of exposed soils.

Best management practices will be implemented during the construction process, with a focus on adjacent habitats and wetlands that lack a provincial alteration approval. Best management practices are provided below:

- The length of time during construction that the wetland topsoil is exposed will be minimized;
- Clean, pH neutral, coarse fill materials will be used within the wetland area;
- Any constructed drainage ditches will be graded such that they do not directly discharge into the wetland;
- The post-construction flow (in and out) from the wetland should be maintained at the same elevation as pre-construction flow (in and out);
- Machinery and personnel will be instructed not to enter the wetland outside of the road right-of-way;
- Vegetation control on road shoulders will be conducted, as necessary, by manual and mechanical clearing during operation; and,
- The slope between the edge of the road surface or ditch and the adjacent wetlands will be re-vegetated to stabilize the slope and limit erosion and sedimentation into each wetland.

Additional mitigation measures that will be implemented during the construction period include:

- Silt laden water is not to be drained or pumped directly into wetlands or watercourses (unless for the purposes of maintaining hydrological inputs). Instead water should be directed to heavily vegetated areas, settling ponds trenches, or similar area, with erosion control at the outlet, and the outlet must be monitored regularly by the contractor;
- Maintain existing vegetation cover whenever possible and minimize overall areas of disturbance. Also, ensure contractors minimize travel across areas of exposed soils. Maintaining existing vegetation cover is the best and most cost-effective erosion control practice;
- All construction site and roadway runoff shall be directed through natural vegetation or through erosion and sediment control devices before it reaches watercourses or wetlands

- Erosion control materials shall be clean, non-ore-bearing, non-watercourse derived and non-toxic materials; and,
- Install all erosion and sediment control practices prior to any soil disturbing activities, when applicable;
- Drainage structures will be incorporated, where necessary, to dissipate hydraulic energy and maintain flow velocities sufficiently low to prevent erosion of native soil material. Examples include:
 - Avoid frequent or unnecessary travel over erosion prone areas;
 - Holding/sediment retention ponds
 - Silt fencing
 - Grubbing berms
 - Cut off drainage channels
 - Rock berms and hay bales to filter water
 - Rock lined channels
 - Covering of exposed soils

Other best management techniques and practices when working adjacent to aquatic receptors include:

- Construction monitoring audits will be completed to ensure protection measures are in place and effective.
- In order to protect wetland habitat from accidental spills, ensure that a spill control and contingency planning is in effect, and its procedures fully communicated to staff; and,
- Ensure all development related activity (*i.e.* construction areas, access roads etc) are located within areas where biophysical field evaluations have been completed and approvals/written authorizations are in place as required, including work within 30m of a wetland or watercourse; and
- Limit clearing within wetland habitat outside of approved wetland alteration areas.

5.2 Monitoring

During construction, MEL understands that the contractor will be responsible for erosion and sediment control measures to ensure that the remaining undisturbed wetland habitat within partially altered wetlands is not impacted by construction activities. General mitigation and erosion and sediment control practices that are outlined in this document must be adhered to, along with any requirements outlined in the pending wetland alteration approval.

Monitoring should continue during the construction period as is needed to ensure remaining wetland habitat is maintained in its natural state.

5.3 Proposed Compensation

The proponent is seeking approval to alter a total area of 0.39 hectares/3,863 m² of wetland habitat. As per discussions between the Proponent and NSE, the Proponent will procure the services of a wetland restoration specialist to compensate for the wetland loss associated with the activities discussed in this application.

A letter detailing this commitment is provided in Appendix H.

We look forward to your attention to this application. Please don't hesitate to contact the undersigned with any questions you might have.

Sincerely,



Andy Walter
Senior Project Manager
McCallum Environmental Ltd.

6.0 REFERENCES

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~~Appendix A: Figures~~

~~Appendix B: Supporting Documents~~

~~Appendix C: Curriculum Vitae~~

~~Appendix D: Priority Species and ACCDC~~

Appendix E: Photo Log

~~Appendix F: Wetland Characterization Table, Data Sheets and Functional Assessment Forms~~

~~Appendix G: Design Drawings~~

~~Appendix H: Wetland Compensation Letter~~