SD 18

Study Area Extension (Square Lake): Wetland and Watercourse Delineation

January 17, 2020

Melissa Nicholson
Atlantic Mining NS
6749 Moose River Rd,
Middle Musquodoboit,
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Re: Touquoy Gold Mine – Study Area Extension (Square Lake): Wetland and Watercourse Delineation

1 INTRODUCTION

Atlantic Mining Nova Scotia (AMNS) retained McCallum Environmental Ltd. (MEL) to conduct a wetland and watercourse assessment within an extension of the current Touquoy Mine Site Study Area located in Middle Musquodoboit, NS.

The Study Area extension is bound between Square Lake to the north and the original study area to the south. The Study Area extension exists within PIDs 40747818 and 00457699 and is approximately 10 ha in size. The Square Lake Study Area extension is provided in Figure 1 (Appendix A).

MEL conducted biophysical assessments to determine the locations of potential wetlands and watercourses within the Study Area. The assessment included an evaluation of desktop resources and a field program on November 7th, 2019.
The purpose of this report is to provide wetland and watercourse locations and characterizations to support continued future development of the Touquoy Mine.

2 METHODOLOGY

2.1 Desktop Review

A background information review of wetlands and watercourses was completed using the Nova Scotia Topographic Watercourse (NSTD) and the Nova Scotia Environment (NSE) Wetlands database. In addition, the NSE "Wetlands of Special Significance" (WSS) database was also reviewed.

2.2 Field Assessment

The field assessment was completed on November 7th, 2019 by MEL wetland delineator Ryan Gardiner. Meandering transects were completed within the Study Area extension to confirm the potential presence of wetlands and watercourses. This report adopts the terms defined by NSE under Section 105 of the *Environment Act*.

> 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 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.

Wetland Data Determination forms were completed within each wetland identified and wetland boundaries and watercourse routes were recorded on a Geneq SX Blue II receiver and SX Blue pad. The Geneq SX Blue II receiver is capable of sub 1 m accuracy.

3 RESULTS

3.1 Desktop Review

According to the database searches a single wetland was identified in the northern extent of Study Area extension along the shoreline of Square Lake. This wetland was verified (WL55) during the field surveys and is described in further detail below. No mapped watercourses are present in the Study Area extension.

Similar to the original Study Area, the desktop review process determined that the Study Area extension is located in an Endangered Mainland Moose Concentration Area. The desktop review also confirmed that the Study Area extension does not exist within or contain the following:

- Ramsar site, Provincial Wildlife Management Area (Crown and Provincial lands only), Provincial Park, Nature Reserve, Wilderness Area or lands owned or legally protected by non-government charitable conservation land trusts;
- Wetlands in designated protected water areas as described within Section 106 of the Environment Act; or,
- A designated wetland of special significance (WSS).

The Study Area extension is situated in upper portions of the Fish River – Square Lake Tertiary Watershed (1EL-5-M). Surface water within this watershed drains south towards Scraggy Lake) located approximately 3 km south of the Study Area extension.

3.2 Field Results

3.2.1 Wetlands

Three wetlands were identified within the Study Area extension (Figure 2, Appendix A). The wetlands were identified as WLs 53 to 55. Confirmation of the presence of hydrophytic vegetation, wetland hydrology and hydric soils was established by the completion of a single data point within each wetland and adjacent upland habitat. Wetland Determination Data Forms are provided in Appendix B.

Wetland 53
Wetland 53 exists as a lentic fen 821 m^2 in size. The wetland exists in a basin formation and intercepts surface water run-off from surrounding low gradient upland habitat and bidirectional flow from Square Lake.

Hydrological conditions encountered at the data point location within the wetland are indicated by intermittent surface water to a depth of 3 cm, a high-water table and saturation at surface.

A survey for hydrophytic vegetation was completed in the wetland. The vegetative community is dominated by Black Spruce (*Picea mariana*), Balsam Fir (*Abies balsamea*) and Tamarack (*Larix laricina*) in the sparse tree and shrub layers. Leatherleaf (*Chamaedaphne calyculata*) and Reed Canary Grass (*Phalaris arundinacea*) were observed to dominate the herbaceous layer.

A soil pit was completed within the wetland to test for hydric soil conditions. Fibric organic soil to a depth of 50+ cm with no restrictive layer was observed. Hydric soil is present as indicated by a Histosol (Indicator A1).

Wetland 54
Wetland 54 exists as an isolated treed swamp 2,058 m^2 in size. The wetland exists in a basin formation and intercepts surface water run-off from surrounding low gradient upland habitat. Wetland 54 is not hydrologically connected to the nearby Square Lake.

Hydrological conditions encountered at the data point location within the wetland are indicated by a high-water table and saturation at surface.

A survey for hydrophytic vegetation was completed in the wetland. The vegetative community is dominated by Balsam Fir in the tree and shrub layers. Sheep Laurel (*Kalmia angustifolia*) and Cinnamon Fern (*Osmunda cinnamomea*) were observed to dominate the herbaceous layer.

A soil pit was completed within the wetland to test for hydric soil conditions. Fibric organic soil to a depth of 20 cm was observed above a restrictive layer of rock. Hydric soil is present as indicated by a Histic Epipedon (Indicator A2).

Wetland 55
Wetland 55 exists as a treed swamp and lentic fen complex that extends beyond the Study Area extension boundary to the north. Within the Study Area extension, 7,069 m^2 of Wetland 55 was delineated. The wetland exists in a basin formation with the treed swamp portion intercepting surface water run-off from surrounding low gradient upland habitat and the fen portion receiving bidirectional flow from Square Lake.

Hydrological conditions encountered at the data point location within the treed swamp portion of the wetland are indicated by a high-water table and saturation at surface.

A survey for hydrophytic vegetation was completed in the wetland. The vegetative community is dominated by Black Spruce and Balsam Fir in the tree and shrub layers. Three-seeded Sedge (*Carex trisperma*) and Cinnamon Fern were observed to dominate the herbaceous layer.

A soil pit was completed within the wetland to test for hydric soil conditions. Fibric organic soil to a depth of 20 cm above a restrictive layer of rock. Hydric soil is present as indicated by a Histic Epipedon (Indicator A2).

General observations within the fen portion of the wetlands indicate that the hydrological, soil and vegetation conditions are similar to those described in Wetland 53. A summary of the data point results and wetland characteristics for each wetland are provided in Table 1 and Table 2.

Table 1: Wetland Determination Data Point Results

Data Point ID	Hydrophytic Vegetation Present:	Hydric Soil Indicator	Indicators of Wetland Hydrology	Positive Test for Wetland Habitat
WL 53	Yes – 2.16 PI Value	A1 – Histosol	Surface water, Saturated at surface, High water table,	Yes
WL 54	Yes – 2.97 PI value	A2 – Hist Epipedon	Surface water, High water table	Yes
UP 53/54	No - 3.24 PI Value	N/A	None	No
WL 55	Yes – 2.4 PI Value	A2 – Hist Epipedon	Surface water, High water table	Yes
UP 55	No – 3.2 PI Value	N/A	None	No

*A Prevalence Index (PI) Value equal to or less than 3 indicates hydrophytic vegetation.

Table 2: Wetland Characteristic Summary

WL ID	Size (m^2)	Type	Landform	Landscape Position	Water Flow Path
WL 53	821	Fen	Basin	Lentic	Bidirectional – nontidal
WL 54	2058	Treed Swamp	Basin	Terrene	Isolated
WL 55	7069	Fen/Swamp Complex	Sloped/Basin	Lentic	Bidirectional - nontidal

The locations of the wetlands are provided in Figure 1 (Appendix A). Representative photos are provided in Appendix C.

3.2.2 Watercourses

The field survey confirmed that no watercourses are present within the Study Area extension.

4 SUMMARY

The identified wetlands present characteristics typical of fen and treed swamp wetlands in Nova Scotia and the region generally. The three wetlands encompass a total combined area of 9,948 m^2 within the Study Area extension. Although the detailed functional assessment process has not been completed at this time, there are no conditions or wetland characteristics observed which trigger the wetland to exist as a Wetland of Special Significance.

4.1 Recommendations

Should alteration of the identified wetlands be required, a wetland alteration application should be compiled and submitted to NSE. To fulfill the requirements of a wetland alteration application additional field surveys are required between June 1st and September 30th to complete wetland functions assessment and species at risk surveys.

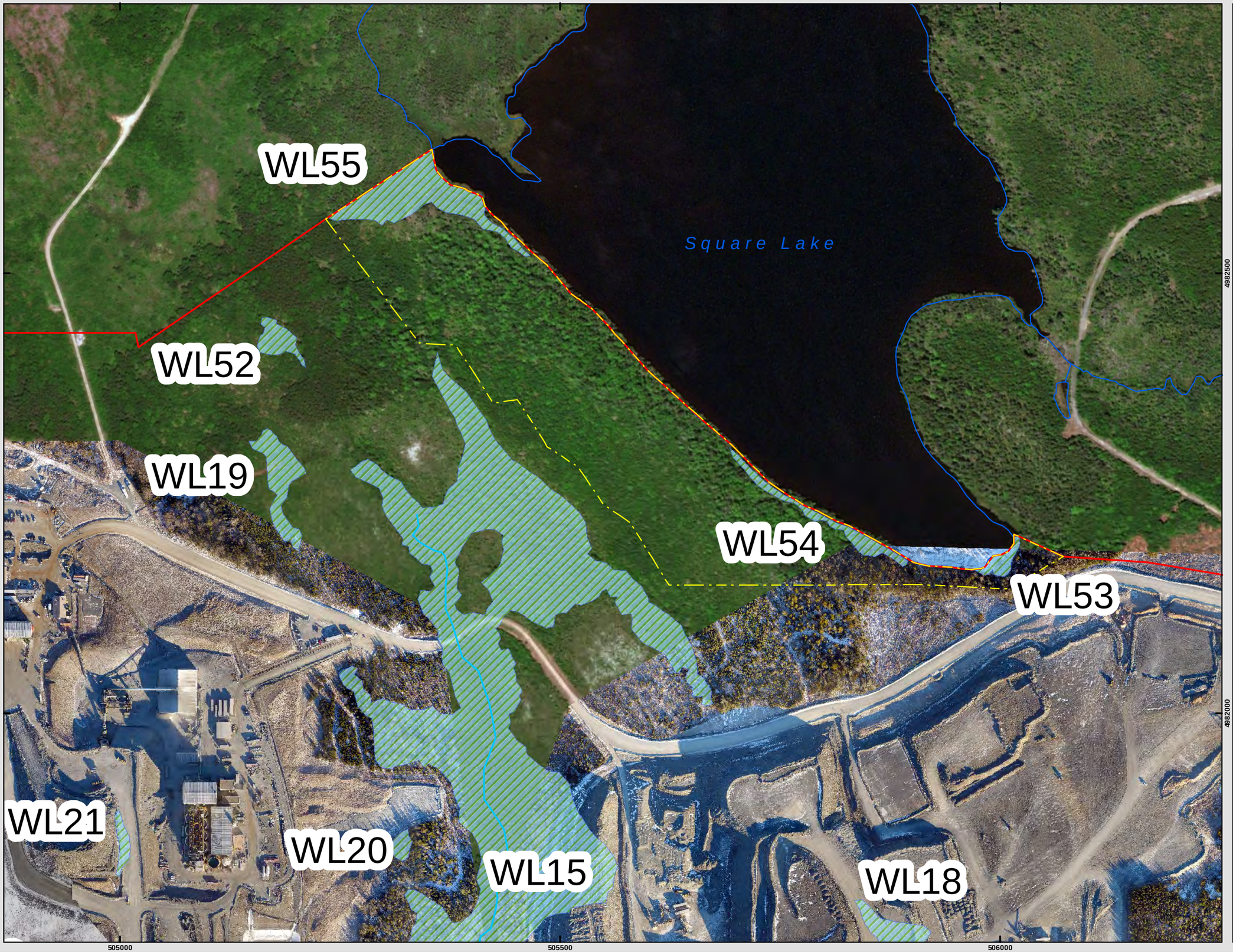
If you have any questions, please don't hesitate to contact the undersigned with any questions you might have.

Sincerely,

Ryan Gardiner,
Intermediate Environmental Scientist
McCallum Environmental Ltd.

Andy Walter
Senior Project Manager
McCallum Environmental Ltd.

APPENDIX A: Figures



Prepared For:

Atlantic Gold

Figure 1

Touquoy Gold Mine

Wetland Delineation Results
Square Lake Study Area Extension

- Field Delineated Watercourse
- NSTDB Mapped Watercourse
- Wetland
- Square Lake Study Area Extension
- Study Area

Coordinate System: NAD 1983 CSRS UTM Zone 20N
Projection: Transverse Mercator
Datum: North American 1983 CSRS
Units: Meter

0 50 100 200 m

1:4,000

Scale when printed @ 11" x 17"

Drawn By: R. Gardiner

Date: 2020-01-03

McCallum Environmental Ltd.

Document Name: 200103_TQ_Wetland_Delineation_Results

APPENDIX B: Wetland Determination Data Forms

WETLAND DETERMINATION DATA FORM – NOVA SCOTIA

Project/Site: TQ Municipality/County: HRM Sampling Date: 7-Nov-19

Applicant/Owner: AMNS Sampling Point: WL 53

Investigator(s): R. Gardiner Affiliation: McCallum Environmental

Landform (hillslope, terrace, etc.): Local relief (concave, convex, none): Concave

Slope (%): Lat: 505991 Long: 4982163 Datum: NAD 83

Soil Map Unit Name/Type: Wetland Type: Fen

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation X, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation X, Soil X, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____	**Is the Sampled Area within a Wetland?** Yes ✓ No ____
Hydric Soil Present?	Yes ✓	No ____	
Wetland Hydrology Present?	Yes ✓	No ____	If yes, optional Wetland Site ID:

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10m²)	Absolute % Cover	Dominant Species?	Indicator Status
1. Picea mariana	10	✓	FACW
2. Larix laricina	5	✓	FAC
3.			
4.			
5.			
	15	= Total Cover	
Sapling/Shrub Stratum (Plot size: 5m²)			
1. Larix laricina	10	✓	FAC
2. Picea mariana	5	✓	FACW
3.			
4.			
5.			
	15	= Total Cover	
Herb Stratum (Plot size: 1m²)			
1. Phalaris arundinacea	25	✓	FACW
2. Rhododendron groenlandicum	8		FACW*
3. Kalmia angustifolia	6		FAC
4. Rosa nitida	2		OBL
5. Chamaedaphne calyculata	35	✓	OBL
6.			
7.			
8.			
9.			
10.			
	76	= Total Cover	
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	37	x 1 =	37
FACW species	48	x 2 =	96
FAC species	21	x 3 =	63
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	106 (A)		229 (B)

Prevalence Index = B/A = 2.16

Hydrophytic Vegetation Indicators:

- ___ Rapid Test for Hydrophytic Vegetation
- ✓ Dominance Test is >50%
- ✓ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

7-Nov-19 TQ

Sampling Point: WL53

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
50 - 0 cm								Organic

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ✓ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Depleted Dark Surface (F7)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Polyvalue Below Surface (S8)
- ___ Thin Dark Surface (S9)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Redox Depressions (F8)
- ___ Red Parent Material (TF2)

Indicators for Problematic Hydric Soils[3]:

- ___ Sandy Gleyed Matrix (S4)
- ___ Coast Prairie Redox (A16)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ✓ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ✓ No ___ Depth (inches): 3 cm

Water Table Present? Yes ✓ No ___ Depth (inches): 0 cm

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): 0 cm

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – NOVA SCOTIA

Project/Site: TQ Municipality/County: HRM Sampling Date: 7-Nov-19

Applicant/Owner: AMNS Sampling Point: Wet 54

Investigator(s): R. Gardiner Affiliation: McCallum Environmental

Landform (hillslope, terrace, etc.): Local relief (concave, convex, none): Concave

Slope (%): Lat: 505 847 Long: 4982190 Datum: NAD 83

Soil Map Unit Name/Type: Wetland Type: Treed Swamp

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ✗, Soil ✗, or Hydrology ✗ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ✗, Soil ✗, or Hydrology ✗ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____	**Is the Sampled Area within a Wetland?** Yes ✓ No ____
Hydric Soil Present?	Yes ✓	No ____	
Wetland Hydrology Present?	Yes ✓	No ____	If yes, optional Wetland Site ID:

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10 m²)	Absolute % Cover	Dominant Species?	Indicator Status
1. Pinus strobus	10		FAC
2. Abies balsamea	65	✓	FAC
3.			
4.			
5.			
	75	= Total Cover	

Sapling/Shrub Stratum (Plot size: 5 m²)			
1. Abies balsamea	25	✓	FAC
2. Picea mariana	5		FACW
3.			
4.			
5.			
	30	= Total Cover	

Herb Stratum (Plot size: 1 m²)			
1. Osmunda cinnamomea	30	✓	FAC
2. Kalmia angustifolia	15	✓	FAC
3. Coptis trifolia	5		FAC
4.			
5.			
6.			
7.			
8.			
9. Sphagnum ground cover			
10.			
	50	= Total Cover	

Woody Vine Stratum (Plot size: ____)			
1.			
2.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species	5	x 2 =	10
FAC species	150	x 3 =	450
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	155 (A)		460 (B)

Prevalence Index = B/A = 2.97

Hydrophytic Vegetation Indicators:

- ___ Rapid Test for Hydrophytic Vegetation
- ✓ Dominance Test is >50%
- ✓ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: Wet 54

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
20-0 cm								Organic

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ✓ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Depleted Dark Surface (F7)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Polyvalue Below Surface (S8)
- ___ Thin Dark Surface (S9)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Redox Depressions (F8)
- ___ Red Parent Material (TF2)

Indicators for Problematic Hydric Soils[3]:

- ___ Sandy Gleyed Matrix (S4)
- ___ Coast Prairie Redox (A16)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock

Depth (inches): 20 cm

Hydric Soil Present? Yes ✓ No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ___

Water Table Present? Yes ✓ No ___ Depth (inches): 20 cm

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): 0 cm

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – NOVA SCOTIA

Project/Site: TQ Municipality/County: HRM Sampling Date: 7-Nov-19

Applicant/Owner: AMNS Sampling Point: Up 53/54

Investigator(s): R. Crewdiner Affiliation: McCallum Environmental

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): _____

Slope (%): _____ Lat: 505 82156 Long: 4982156 Datum: NAD 83

Soil Map Unit Name/Type: _____ Wetland Type: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation X, Soil C, or Hydrology V significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation X, Soil X, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✓	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes _____	No ✓	If yes, optional Wetland Site ID: _____

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10 m²)	Absolute % Cover	Dominant Species?	Indicator Status
1. Abies balsamea	30	✓	FAC
2. Acer rubrum	10	✓	FAC
3.			
4.			
5.			
	40 = Total Cover		

Sapling/Shrub Stratum (Plot size: 5 m²)			
1. Abies balsamea	40	✓	FAC
2. Picea glauca	20	✓	FAC
3.			
4.			
5.			
	60 = Total Cover		

Herb Stratum (Plot size: 1 m²)			
1. Pteridium aquilinum	35	✓	FACU
2. Cornus canadensis	8		FAC
3. Trientalis borealis	2		FAC
4. Kalmia angustifolia	3		FAC
5.			
6.			
7.			
8.			
9.			
10.			
	48 = Total Cover		

Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 80% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species 113	x 3 =	339
FACU species 35	x 4 =	140
UPL species	x 5 =	
Column Totals: 148 (A)		479 (B)

Prevalence Index = B/A = 3.24

Hydrophytic Vegetation Indicators:

- ___ Rapid Test for Hydrophytic Vegetation
- ✓ Dominance Test is >50%
- X Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No ✓

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

TQ
7-Nov-19 Sampling Point: Up 53

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
3-0 cm								Organic

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Depleted Dark Surface (F7)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Polyvalue Below Surface (S8)
- ___ Thin Dark Surface (S9)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Redox Depressions (F8)
- ___ Red Parent Material (TF2)

Indicators for Problematic Hydric Soils[3]:

- ___ Sandy Gleyed Matrix (S4)
- ___ Coast Prairie Redox (A16)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock

Depth (inches): 3 cm

Hydric Soil Present? Yes ____ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No ✓ Depth (inches): ____

Water Table Present? Yes ____ No ✓ Depth (inches): ____

Saturation Present? (includes capillary fringe) Yes ____ No ✓ Depth (inches): ____

Wetland Hydrology Present? Yes ____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – NOVA SCOTIA

Project/Site: TQ Municipality/County: HRM Sampling Date: 7-Nov-19

Applicant/Owner: AMNS Sampling Point: Wet 55

Investigator(s): R. Gardiner Affiliation: McCallum Environmental

Landform (hillslope, terrace, etc.): < Local relief (concave, convex, none): concave

Slope (%): _____ Lat: 505267 Long: 4982560 Datum: NAD 83

Soil Map Unit Name/Type: _____ Wetland Type: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation X, Soil _____, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil X, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes ✓ No _____	
Wetland Hydrology Present?	Yes _____ No _____	If yes, optional Wetland Site ID: _____

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10m²)	Absolute % Cover	Dominant Species?	Indicator Status
1. Picea mariana	30	✓	FACW
2. Abies balsamea	10	✓	FAC
3.			
4.			
5.			
	40	= Total Cover	

Sapling/Shrub Stratum (Plot size: 5m²)			
1. Abies balsamea	30	✓	FAC
2. Picea mariana	10	✓	FACW
3.			
4.			
5.			
	40	= Total Cover	

Herb Stratum (Plot size: 1m²)			
1. Osmunda cinnamomea	40	✓	FAC
2. Carex trisperma	25	✓	OBL
3. Kalmia angustifolia	5		FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	70	= Total Cover	

Woody Vine Stratum (Plot size: _____)			
1.			
2.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	25	x 1 =	25
FACW species	40	x 2 =	80
FAC species	85	x 3 =	255
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	150 (A)		360 (B)

Prevalence Index = B/A = 2.4

Hydrophytic Vegetation Indicators:

- ___ Rapid Test for Hydrophytic Vegetation
- ✓ Dominance Test is >50%
- ✓ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: wet 55

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
20 - 0								Organic

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ✓ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Depleted Dark Surface (F7)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Polyvalue Below Surface (S8)
- ___ Thin Dark Surface (S9)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Redox Depressions (F8)
- ___ Red Parent Material (TF2)

Indicators for Problematic Hydric Soils[3]:

- ___ Sandy Gleyed Matrix (S4)
- ___ Coast Prairie Redox (A16)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock

Depth (inches): 20 cm

Hydric Soil Present? Yes ✓ No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ___

Water Table Present? Yes ✓ No ___ Depth (inches): ~10 cm

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): 0 cm

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – NOVA SCOTIA

Project/Site: TQ Municipality/County: HRM Sampling Date: 4-Nov-19

Applicant/Owner: AMNS Sampling Point: Wp 55

Investigator(s): R Gardiner Affiliation: MEL

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____

Slope (%): _____ Lat: 505296 Long: 4982553 Datum: _____

Soil Map Unit Name/Type: _____ Wetland Type: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation X, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation ✓, Soil ✓, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✓	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes _____	No ✓	If yes, optional Wetland Site ID: _____

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10 m²)	Absolute % Cover	Dominant Species?	Indicator Status
1. Betula papyrifera	15	✓	FACU
2. Picea glauca	5	✓	FAC
3.			
4.			
5.			
	20	= Total Cover	

Sapling/Shrub Stratum (Plot size: 5 m²)			
1. Betula papyrifera	15	✓	FACU
2. Abies balsamea	25	✓	FAC
3. Picea glauca	5		FAC
4.			
5.			
	45	= Total Cover	

Herb Stratum (Plot size: 1 m²)			
1. Kalmia angustifolia	55	✓	FAC
2. Cornus canadensis	25	✓	FAC
3. Chamaedaphne calyculata	5		FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	85	= Total Cover	

Woody Vine Stratum (Plot size: _____)			
1.			
2.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 67% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species 120	x 3 =	360
FACU species 30	x 4 =	120
UPL species	x 5 =	
Column Totals: 150 (A)		480 (B)

Prevalence Index = B/A = 3.2

Hydrophytic Vegetation Indicators:

- ___ Rapid Test for Hydrophytic Vegetation
- ✓ Dominance Test is >50%
- X Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No ✓

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

7-Nov-19 TQ Sampling Point: up 55

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
3-0								Organic

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Depleted Dark Surface (F7)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Polyvalue Below Surface (S8)
- ___ Thin Dark Surface (S9)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Redox Depressions (F8)
- ___ Red Parent Material (TF2)

Indicators for Problematic Hydric Soils[3]:

- ___ Sandy Gleyed Matrix (S4)
- ___ Coast Prairie Redox (A16)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock

Depth (inches): 3cm

Hydric Soil Present? Yes ____ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No ✓ Depth (inches): ____

Water Table Present? Yes ____ No ✓ Depth (inches): ____

Saturation Present? (includes capillary fringe) Yes ____ No ✓ Depth (inches): ____

Wetland Hydrology Present? Yes ____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

APPENDIX C: Photolog

Appendix C: Photolog

Photo 1: Representative Fen Habitat in WL 53

Photo 2: Representative Fen Habitat in WL 53

Photo 3: Representative Swamp Habitat in WL 54

Photo 4: Representative Swamp Habitat in WL 54

Photo 5: Representative Swamp Habitat in WL 55

Photo 6: Representative Fen Habitat in WL 55