Appendix F

Aquatic Resource Assessment Report

DILLON CONSULTING

WOCAWSON ENERGY PROJECT

Aquatic Habitat and Wetlands Summary Report (Draft)

July 2018 – 18-6975

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1.0 Introduction

Dillon Consulting Limited (Dillon) was retained by the Wocawson Energy Limited Partnership (WLP) to complete natural environment surveys in support of a future provincial registration for an Environmental Impact Assessment (EIA) of the Wocawson Energy Project ("the proposed project"). WLP is a partnership between Tobique First Nation (51%) and Natural Forces NB Inc. (49%).

The proposed project is located in an area in which several watercourses and wetlands have been identified. Aquatic habitat and wetlands are considered an important feature and valued component (VC) related to the proposed project. Natural environment surveys for the proposed project were conducted for VCs based on an understanding of the environmental features of the proposed project area, the nature of the proposed project, and the potential interactions that may occur between the proposed project and the environment/VCs.

This report provides a summary of the aquatic habitat and wetland surveys conducted in support of the Wocawson Energy Project EIA registration, and includes: a brief description of the proposed project; a description of the scope and methodology used for the aquatic habitat surveys; a summary of the results; and, an assessment of residual effects (including potential interactions and mitigation) of the proposed project on the aquatic environment. Results of wetland delineation and analysis of wetland function are also summarized.

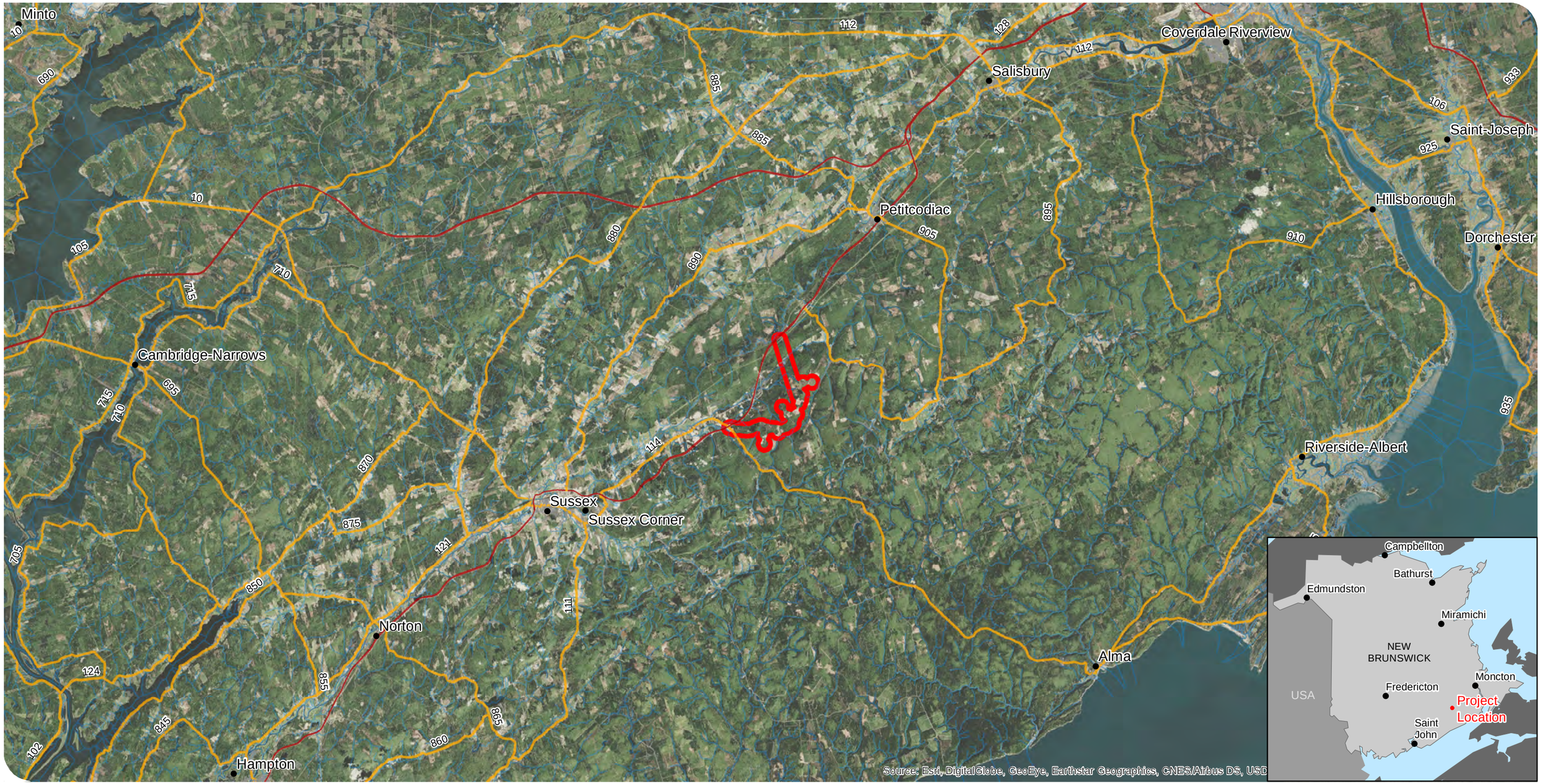
Though focused environmental surveys (i.e. vegetation, wildlife, wildlife habitat, and species at risk/species of conservation concern) were completed concurrently, the focus of this report is on the aquatic environment, including wetlands. Separate reports will be provided for other components of the terrestrial environment, specifically for bats, birds, wildlife and wildlife habitat, and vegetation.

1.1 Project Description

The proposed 20-40 megawatt (MW) Wocawson Energy Project is expected to provide electricity to approximately 3,600 – 7,200 New Brunswick homes. The turbines for the proposed project are sited on approximately 1,150 hectares (ha) of Crown land located approximately 20 km east of the Town of Sussex, in Kings County, New Brunswick (refer to **Figure 1**). The transmission line associated with the Project will extend across Crown land as well as private land to connect to the existing power grid.

The project area includes 12 proposed turbine locations (with 6-12 turbines installed), connector lines, a substation and transmission line, as well as pre-existing road infrastructure (Mitton Road) to be upgraded for the proposed project (refer to **Figure 2**). Mitton Road (located off NB Route 114) is the main access to the proposed project area.

Although the developed project is anticipated to initially only include 6 turbines, locations for 12 turbines were assessed to allow WLP the opportunity to refine the project footprint based on environmental constraints and to plan for potential future growth.



NATURAL FORCES TECHNOLOGIES
Wocawson Energy Project

Wocawson Energy Project Location
FIGURE 1

Project Location
Watercourses

Road Network
Expressway / Highway
Freeway
Local / Street

DILLON CONSULTING

MAP DRAWING INFORMATION:
DATA PROVIDED BY NBDERD

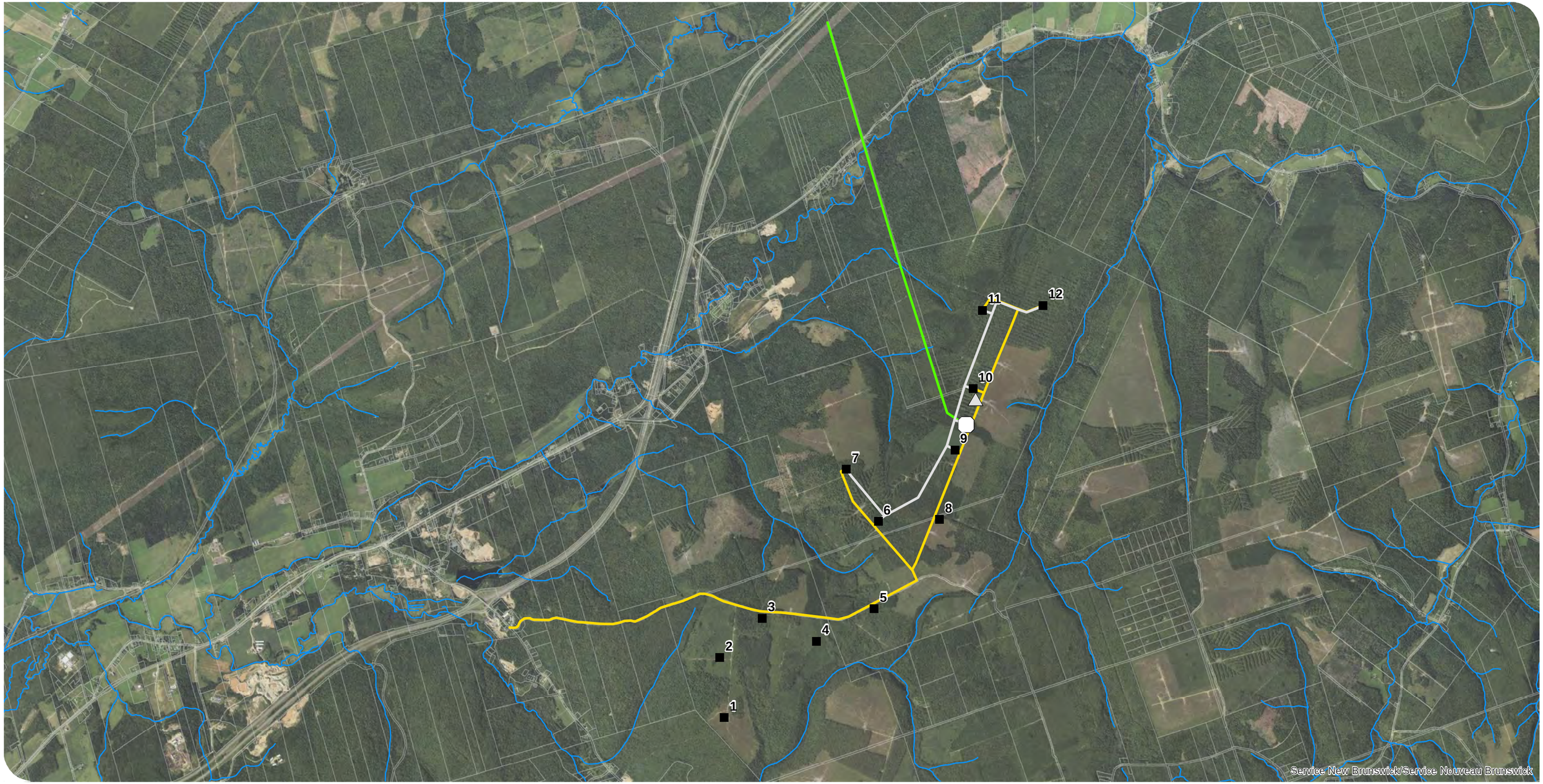
MAP CREATED BY: JNH
MAP CHECKED BY: AS
MAP PROJECTION: NAD 1983 CSRS New Brunswick Stereographic

0 5 10 km

SCALE 1:300,000

FILE LOCATION: G:\CAD\GIS\186975_SUSSEX EAST\SUSSEX EAST WIND PROJECT\MAPS FOR REPORT\PROJECT LOCATION JULY 4 2018_JNH

PROJECT: 18-6975 STATUS: DRAFT DATE: 2018-07-18



NATURAL FORCES TECHNOLOGIES
Wocawson Energy Project

Wocawson Energy Project Site Plan
FIGURE 2

Proposed Turbine Locations
Substation
Met Tower
Road Upgrade
Proposed Transmission Line
Watercourses
Collector
PID

DILLON CONSULTING

MAP DRAWING INFORMATION:
DATA PROVIDED BY NBDERD

MAP CREATED BY: JNH
MAP CHECKED BY: ACS
MAP PROJECTION: NAD 1983 CSRS New Brunswick Stereographic

0 0.5 1 2 km

SCALE 1:45,000

FILE LOCATION: G:\CAD\GIS\186975_SUSSEX EAST\SUSSEX EAST WIND PROJECT\MAPS FOR REPORT\SITE PLAN JULY 9 2018_JNH

PROJECT: 18-6975 STATUS: DRAFT DATE: 2018-07-18

The proposed turbine layout includes the sites for up to 12 turbines located along a ridge running approximately northeast-southwest between elevations 225 m and 275 m above mean sea level (amsl). The general project area is recognized to have an energetic wind regime due to its high elevation (Natural Forces, 2018). Local topography is undulating, with several low ridges also following a northeast-southwest orientation.

The majority of the proposed project site is characterized as being predominantly in an early stage of forest regeneration or plantation due to historic and recent commercial forestry operations. Many of the turbine locations have been selected in areas of recent cut over (i.e., clear-cut and select-cut areas) to minimize the destruction of potentially undisturbed or more mature habitat. No mapped or unmapped watercourses or wetlands were observed within the footprint of proposed turbine locations. An unmapped ephemeral drainage channel was observed along Mitton Road (proposed road upgrade); no wetlands were observed in this area.

The proposed transmission line runs approximately north-south and crosses a variety of land uses such as gravel pits, rural residential property, recent clear cuts, and areas of immature to mature coniferous and deciduous forests in various stages of regeneration. The northern portion of the proposed transmission line crosses three mapped watercourses and one unmapped watercourse. The proposed transmission line does not cross any mapped (regulated) wetlands; however, it crosses 3 unmapped wetlands. One wetland (located in the floodplain of the Kennebecasis River) is identified on the draft beta wetland mapping that is being proposed as the new guidance (not yet in effect). WLP recognizes the important role of wetlands and realigned the transmission line during the design phase of the proposed project to avoid crossing or affecting mapped (regulated) wetlands in the area of the proposed project.

To facilitate the existing forestry operations, several logging roads have been constructed and maintained across the area. WLP has selected the proposed project site to use existing roads reducing the need for new road construction. Additionally, several groomed snowmobile trails that pass through the proposed project area are frequently used during the winter months. WLP recognizes that the local snowmobile club is a concerned stakeholder and thus WLP has selected the proposed locations for site infrastructure to minimize the possibility that snowmobile trails would be affected, or that construction of new trails would be required as a result of the project.

1.1.1 Siting Considerations

WLP has extensive knowledge with respect to the development of wind farms on lands with favourable characteristics to provide efficient renewable energy. Many considerations are taken into account during site selection that focus on efficiently delivering renewable energy to the local community in a way that minimizes the effects on the community and the environment (Natural Forces, 2018).

Specifically, the proposed project area is favourable due to the following characteristics (in no particular order): the available wind resource, the project distance from residential dwellings and environmentally sensitive features, proximity to the New Brunswick Power (NB Power) transmission system, and the existing land use and disturbed nature of the area due to extensive forestry activities (Natural Forces,

2018). The following is a list of factors that have been considered during the site selection and design process:

Technical Considerations:

- Sufficient wind resource;
- Regional topography;
- Proximity to transmission system; and,
- Turbine technology.

Environmental Considerations:

- Proximity to provincially regulated wetlands;
- Proximity to residential dwellings or other sensitive buildings;
- Sensitivity of flora and fauna;
- Proximity to provincial or national parks and nature reserves; and,
- Risk of archaeological resource disturbance.

Land use considerations:

- Known culturally significant areas;
- Current land use;
- Historical land use;
- Future land use;
- Available access to the land; and,
- Proximity to residential properties, communities and towns.

1.1.2 Physical Components of the Project

The proposed project will be comprised of 6-12 Enercon wind energy generators, and turbine size is not expected to exceed approximately 135 m in total hub height with a blade length of 72 m (exact model not yet determined). Refer to **Figure 3** for a conceptual rendering of the proposed turbine design.

The transmission line will extend approximately 5.6 km across privately owned lands, within a cleared corridor approximately 75 m wide, and will connect with existing New Brunswick Power infrastructure along the New Brunswick Department of Transportation and Infrastructure (NBDTI) right-of-way for Route 1. The proposed project's output at the point of interconnection to the electrical grid will be 20 - 40 MW.

The project's lifespan ('design life') is expected to be 30-years (which is unique to Enercon wind turbines) (Natural Forces, 2018). The 30-year design life allows the Project to align itself with a 30-year Power Purchase Agreement (PPA) with NB Power, and allow a longer, stable energy production. Natural Forces has used Enercon machines exclusively for all its community wind projects currently under operation and has a long-standing relationship with the company.

Figure 3: Anticipated Turbine Hub and Blade Lengths

Base photo reference: Enercon https://www.enercon.de/en/products/ep-4/e-141-ep4/

1.1.3 Project Schedule

The proposed project schedule and activities are currently arranged as four distinct phases, as described in **Table 1**, below:

Table 1: Anticipated Project Schedule

Phase	Phase Details	Anticipated Schedule
1. Development Phase	This phase includes the post power purchase agreement development activities (including the EIA and related work).	Q4 2017 to Q1 2019
2. Pre-Construction Phase	This phase includes pre-construction activities, including: financing arrangement for debt and equity, wind turbine supply negotiation, site design, execution of the Facilities Study Agreement, tendering for all construction contracts, and final construction-related permitting.	Q4 2018 to Q2 2019
3. Construction Phase	This phase includes construction and commissioning related activities, including: tree clearing and grubbing, road building, electrical works, foundation pour, turbine delivery, turbine assembly, and final Project commissioning.	Q1 2019 to Q4 2019 Commercial Operation anticipated to begin Q4 2019
4. Operation Phase	This phase includes activities that occur during the operation of the wind project, including: post-construction monitoring, annual monitoring reports, remote monitoring of turbine performance, and maintenance.	Q4 2019 to decommissioning of the turbines (30 year lifespan)

The decommissioning phase of the project will include activities required to decommission the project at the end of its service life, including: the removal of the turbine materials and associated infrastructure to an appropriate underground depth and restoration of the site. The precise timing of the decommissioning of the proposed project is currently unknown. If possible, the wind turbines' lifespan may be extended by replacing parts or otherwise refurbishing them to produce additional energy after their original 30-year lifespan. Therefore, the decommissioning phase of the project is not considered within the scope of this assessment. Once the proposed project is approaching the end of its useful life, a decommissioning plan will be submitted to the New Brunswick Department of Environment and Local Government (NBDELG) prior to undertaking decommissioning activities, which reflects the guidance and regulations in place at that time.

2.0 Aquatic Habitat and Wetland Surveys Scope and Methodology

This section details the scope of the aquatic habitat and wetland surveys conducted for the proposed project, and the methods that were used to conduct the desktop and field assessments.

2.1 Scope of Work

2.1.1 Regulatory Guidance

Under the New Brunswick *Environmental Impact Assessment Regulation* 87-83 (EIA Regulation) within the *Clean Environment Act,* areas of sensitive habitat and legally listed species at risk should be avoided to the extent possible. To better understand the types and quality of habitat in the area of the proposed project, a baseline study of available aquatic habitats, in addition to terrestrial habitats, is required to be conducted within the proposed project area.

The New Brunswick "Guide to Environmental Impact Assessment in New Brunswick" (NBDELG, 2018) requires that physical and natural features of the land be described. In relation to the aquatic environment, the guide recommends consideration of the following features:

- Aquatic or wetland features that could affect the project;
- The type or significance of any fish populations or habitat;
- Any known presence of aquatic species at risk or their habitat; and
- Any known presence of critical, sensitive or protected aquatic or wetland habitat.

Furthermore, the NBDELG's "Additional Information Requirements for Wind Turbines" sector guideline (NBDELG, 2004) requires that a description of habitat types (including the components above) be obtained at and surrounding each turbine site.

2.1.2 Valued Component Rational and Scope of Work

The scope of work for the aquatic habitat and wetland surveys is based upon an understanding of the nature of the proposed project and project area, as well as Dillon's experience in assessing similar landscapes. The scope of work included a desktop assessment and field assessment of mapped and unmapped watercourses as well as mapped (regulated) and unmapped (unregulated) wetlands within the assessment area. For the purposes of this report and in support of a potential future EIA registration for the project, the aquatic environment considers wetlands and watercourses, which herein includes descriptions of the following:

- **Watercourses** – Watercourses in New Brunswick are defined as: "*A feature in which the primary function is the conveyance or containment of water, which includes: a) the bed, banks and sides*

of any watercourse that is depicted on the New Brunswick Hydrographic Network layer (available on GeoNB Map Viewer); b) the bed, banks and sides of any incised channel greater than 0.5 metres in width that displays a rock or soil (mineral or organic) bed, that is not depicted on New Brunswick Hydrographic Network layer (available on GeoNB Map Viewer); water/flow does not have to be continuous and may be absent during any time of year; or c) a natural or man-made basin (i.e. lakes and ponds)." (NBDELG, 2017);

- **Wetlands** – Wetlands in New Brunswick are defined as "*land that either periodically or permanently has a water table at, near or above the land's surface or that is saturated with water, and sustains aquatic processes as indicated by the presence of hydric soils, hydrophytic vegetation and biological activities adapted to wet conditions*" (NBDELG, 2012);
- **Aquatic Species At Risk and Aquatic Species of Conservation Concern** – Aquatic Species of Conservation Concern include aquatic species listed by the federal and provincial authorities as well as those defined as regionally sensitive by the Atlantic Canada Conservation Data Centre (AC CDC); and
- **Unique or Sensitive Aquatic Habitats** – includes aquatic habitats identified as protected or managed by federal and provincial authorities or non-governmental organizations (e.g., Nature Trust of New Brunswick).

Aquatic habitat was selected as a valued component (VC) related to the proposed project due to the possible environmental effects of:

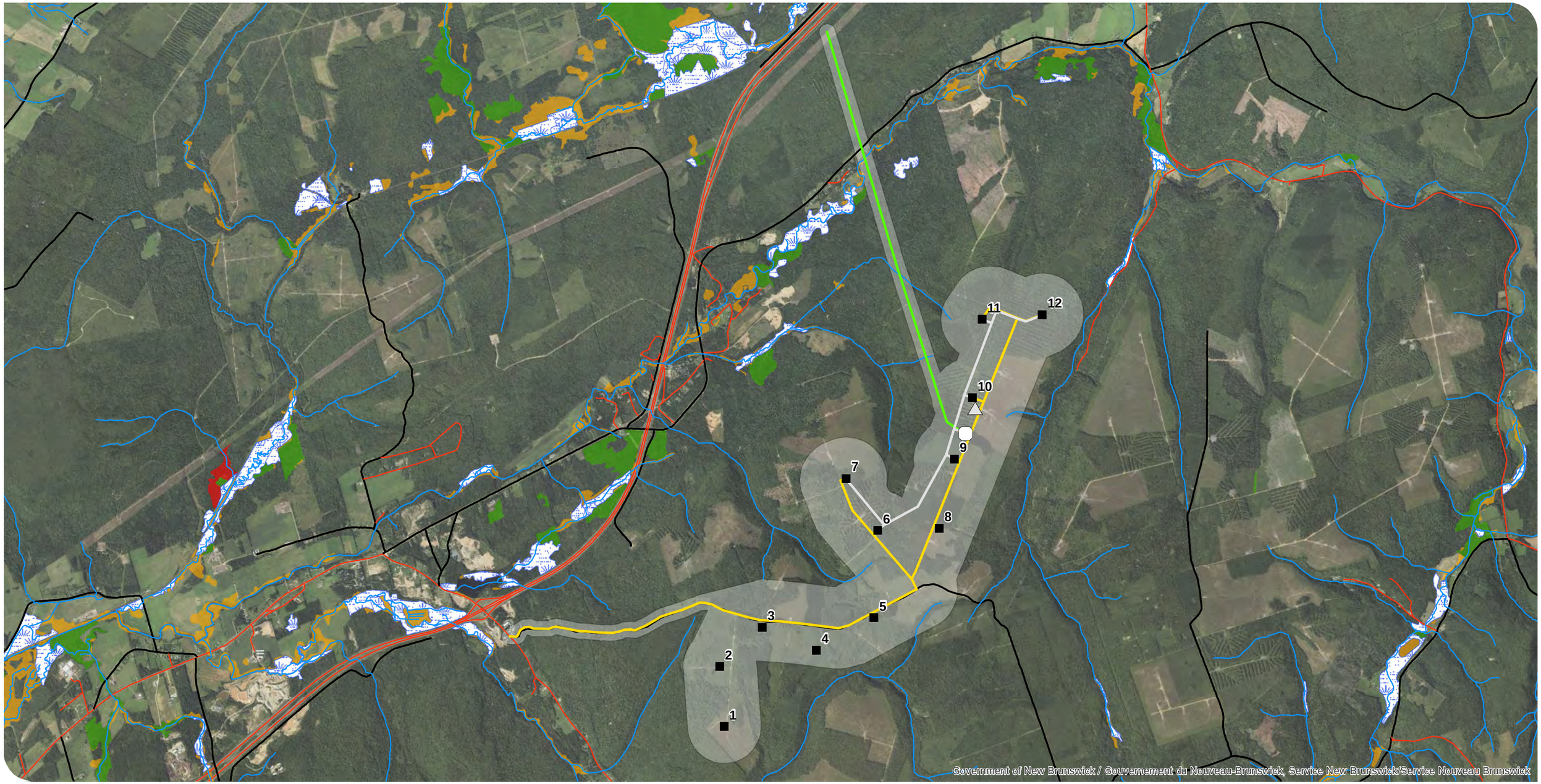
- A potential change or alteration of, disruption to, or removal of aquatic (including fish) habitat or wetlands as a result of the proposed project; and
- Effects to aquatic species listed under the federal *Species at Risk Act* (*SARA*) and/or the New Brunswick *Species at Risk Act* (NB *SARA*).

2.1.3 Spatial Boundaries

For the purpose of this assessment, the spatial boundaries (i.e., the assessment area) have been identified as the area encompassing the access roads, each turbine location (plus a 150 m radius surrounding each turbine), and the transmission/collector lines (consisting of a 75 m-wide corridor plus a 75 m allowance on each side of the centreline of the proposed lines), extending between the proposed project location to the existing power infrastructure. Refer to **Figure 4**.

2.1.4 Temporal Boundaries

The temporal boundaries for the assessment define the time periods for which likely environmental effects of the Project are considered. The temporal boundaries of this assessment include the duration of the construction phase (approximately 1 year in duration during 2019) and subsequent operation phase (approximately 30 years following construction) of the Project. In the construction phase, specific construction-related effects are anticipated to be short term and limited to either the duration of the activities that produce the effects or the duration of the construction phase. Effects associated with the



NATURAL FORCES TECHNOLOGIES
Wocawson Energy Project

Wocawson Energy
Project Assessment Area
FIGURE 4

- Proposed Turbine Locations
- Substation
- Met Tower
- Collector
- Road Upgrade
- Proposed Transmission Line

Road Network
- Collector
- Roads
- Watercourses
- Regulated Wetlands
- Assessment Area

NBDELG Draft Beta Wetland Mapping (unregulated)
- Provincially Significant Wetlands
- Intermediate Wetlands
- Forested Wetlands

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MAP DRAWING INFORMATION:
DATA PROVIDED BY NBDERD

MAP CREATED BY: SCN
MAP CHECKED BY: ACS
MAP PROJECTION: NAD 1983 CSRS New Brunswick Stereographic

0 0.5 1 2 km

SCALE 1:45,000

FILE LOCATION: G:\CAD\GIS\186975_SUSSEX EAST\
SUSSEX EAST WIND PROJECT\MAPS FOR REPORT\STUDY AREA
JULY 9 2018_JNH

PROJECT: 18-6975 STATUS: DRAFT DATE: 2018-07-18

operation phase are longer term, as the proposed Project is intended to be operational for at least 30 years (although the lifespan may be extended with routine maintenance or refurbishment as appropriate).

2.2 Methodology

2.2.1 Desktop Analysis Methods and Sources

Prior to completing the terrestrial field surveys, Dillon reviewed readily available information from reputable sources. The information was reviewed to evaluate the potential for aquatic species of conservation concern (SOCC) and/or aquatic species at risk (SAR) within the general area of the proposed project and to assist in scoping the field programs. The information was reviewed, along with information on aquatic habitats and wetlands present in the general area. Dillon completed a review of the following sources and data lists prior to completing the field surveys:

- Atlantic Canada Conservation Data Centre (AC CDC);
- Environment and Climate Change Canada (ECCC);
- Department of Fisheries and Oceans (DFO);
- New Brunswick Department of Energy and Resource Development (NBDERD);
- New Brunswick Department of the Environment and Local Government (NBDELG);
- The federal Species at Risk Registry;
- The Committee on the Status of Endangered Wildlife in Canada (COSEWIC);
- Publically available GIS map layers (e.g. ecological land classification, forest and non-forest inventory, wetland inventory, Protected Natural Areas, Wildlife Management Zones);
- High resolution aerial photography;
- New Brunswick Light Detection and Ranging (LiDAR) mapping projections;
- GeoNB wetland and watercourse mapping;
- Forest Watershed Research Center Cartographic Depth to Water Index (Arp, 2018);
- Kennebecasis Watershed Restoration Committee publications; and
- Canadian Rivers Institute (CRI) watercourse and fish population study (2015).

2.2.2 Field Survey Methods

Dillon was retained by WLP to survey the aquatic habitats and wetlands within the assessment area, including the assessment of mapped and unmapped watercourses and the delineation and functional assessment of regulated (mapped) and non-regulated (unmapped) wetlands. Field surveys of the aquatic habitats and wetlands in the assessment area were conducted from June 26 to 28, 2018 and July 5 to 6, 2018, by Dillon biologists experienced in aquatic/ fish habitat surveys and certified in wetland identification, delineation and ecology as well as Wetland Ecosystems Services Protocol (WESP-AC)

functional assessment methods. The detailed methods used for both watercourse and wetland assessments are summarized in the following sections.

2.2.2.1 Watercourse Assessment

The watercourse assessments were conducted within the assessment area in concert with other targeted field surveys including: rare plants and vegetation, wetlands, and terrestrial wildlife and wildlife habitat. Using the NBDERD and DFO standard aquatic assessment forms, fish habitat and aquatic features were assessed within 50 m upstream and 100 m downstream of the proposed "crossing". Assessment criteria included:

- **Description of aquatic habitat type:**
  Habitat types within each watercourse was described as riffle, run, pool or flat, where possible in the area of the proposed project;
- **Dominant substrate type and embeddedness:**
  Dominant substrate types were described and documented by percent of relative abundance. Substrate type (e.g. gravel or silt) is especially important for fish spawning habitat;
- **Stream channel characteristics:**
  Stream channel characteristics including average wet width, approximate bankfull width, average wetted depth and maximum wetted depth were measured in the field;
- **Instream cover and overhead canopy cover ratings:**
  Instream cover such as submerged woody debris, cobble, boulders, aquatic vegetation was documented, and overhead canopy cover ratings (percent covered by shrubs and trees) were scored;
- **Fish habitat suitability:**
  Habitat suitability for fish is assessed (based on the evaluation of habitat type, substrate type, instream cover, overhead cover and other ecological observations);
- **Environmental Conditions and Water Level:**
  Environmental conditions (e.g. drier than normal seasonal conditions) were noted during the assessment and water level was rated as "low, moderate or high". Hotter and drier environmental conditions resulting in lower water levels will stress salmonid fish populations;
- **Bank stability:**
  Bank stability and presence of eroding banks (potential for natural and anthropogenic sources) was assessed within the area of the project; and,
- **Riparian vegetation community:**
  In addition to the vegetation species list provided in the "Vegetation Summary" report (Dillon, 2018c), the riparian vegetation community was described by percent trees, shrubs grasses and bare ground.

A fish presence or absence visual survey was also conducted where fish habitat was present within the proposed project area. Representative photos (provided in *Section 3.1*) and GPS points (using a handheld GPS unit and Arc Geographic Information Systems (ArcGIS) applications) were collected for each watercourse during the field assessments.

2.2.2.2 Wetland Delineation and Functional Assessment

In addition to the watercourse assessments, a field delineation and functional assessment was conducted for three unmapped (non-regulated) wetland areas. No mapped wetlands are located within the assessment area for the proposed project. The following subsections describe the methods used to determine, delineate and functionally assess the field identified wetlands.

Wetland Determination, Delineation and Characterization

The methods of wetland determination and delineation are based upon established protocols for wetland delineation, which are outlined in the US Army Corps of Engineers Wetland Delineation Manual (Environmental Laboratory, 1987/2008). Wetland determination and delineation is primarily focused upon establishing the wetland-upland edge, and is based upon the presence of positive indicators for three parameters, including:

- Hydric (wet) soil conditions;
- Hydrophytic (wet adapted) vegetation; and
- Wetland hydrology.

Sample points for these three parameters were established at representative locations within the field identified wetlands. Upon positive wetland determination (i.e., positive indicators identified for soils, hydrology and vegetation), a wetland edge condition was established and georeferenced using a handheld GPS (3 to 5 m accuracy).

Hydric Soils

Hydric soil conditions develop when an area is inundated or saturated with water for a sufficient length of time during the growing season, such that an anaerobic (oxygen free) environment is established in the soil. These anaerobic conditions may manifest themselves in a variety of ways, such as through the formation of redox features (reduction-oxidation), the development of organic soils, i.e., peat-formation, the creation of hydrogen sulphide (rotten egg odour), and many others.

Soil sampling was performed to point of refusal to identify conditions in both wetland and upland conditions. Soil horizons were documented in terms of their texture, thickness, color (Munsell value/chroma/hue) and presence of hydric soil indicators. Hydric soil indicators were determined as per "Field Indicators of Hydric Soils in the United States" (USDA, 2010).

Hydrophytic Vegetation

Hydrophytic vegetation arises in areas where inundation or saturation by water is able to exert a controlling influence on the plant community assemblage. In these areas, those plant species which are

adapted to high-moisture environments tend to dominate. In order for a given area to classify as a wetland, hydrophytic vegetation should account for the majority (>50%) of a sample sites' total vegetation.

Every plant species has a wetland indicator status, including: facultative (FAC), facultative wetland (FACW), or obligate (OBL) (the species' estimated probability of occurring within a wetland). Wetland indicator statuses for plant species were determined as per USDA Region 1 (Nova Scotia/New Brunswick) listings.

Plant species encountered at each sample location were cataloged into three separate strata (tree, shrub, and herb) and their percent cover within a given plot size was documented (10 m, 5 m and 1.5 m radius, respectively). Refer to field delineation data sheets provided in **Appendix A**.

Wetland Hydrology

Wetland hydrology is established by the presence of primary and secondary hydrology indicators. Primary hydrology indicators (of which at least one must be present) include conditions such as the presence of surface water, a high water table, ground saturation, and drift and sediment deposits among many others. Secondary indicators (of which two are required, in the absence of a primary indicator) include surface soil cracking, obvious drainage patterns, and moss trim lines, among others.

Both at the prepared soil pits within the wetland and over the greater wetland area, observations were made regarding the presence of a hydrological regime which would sustain wetland processes. The context of the site, location, and the microtopography of the wetland area are taken into consideration during the assessment.

Functional Assessment: Wetland Ecosystem Services Protocol-Atlantic Canada (WESP-AC)

WESP-AC represents a standardized approach to the way data is collected and interpreted to indirectly yield relative estimates of a wide variety of important wetland functions and their associated benefits.

WESP-AC generates scores (0 to 10 scale) and ratings (Lower, Moderate, Higher) for a variety of wetland functions using visual assessments of weighted ecological indicators. The number of indicators that is applied to estimate a particular wetland function depends on which function is being assessed. The indicators are then combined in a spreadsheet using logic-based, mathematical models to generate the score and rating for each wetland function and benefit. Together they provide a profile of "what a wetland does."

For each function, the scores and ratings represent a particular wetland's standing relative to those in a statistical sample of non-tidal wetlands previously assessed in the Province (98 for New Brunswick) (Adamus, 2018). **Table 2** provides a list of various functions, their definitions, and potential benefits.

Table 2: Benefits of Wetland Functions Scored by WESP-AC

Function	Definition	Potential Benefits
Hydrologic Functions:		
Water Storage and Delay	The effectiveness for storing runoff or delaying the downslope movement of surface water for long or short periods.	Flood control, maintain ecological systems
Stream Flow Support	The effectiveness for contributing water to streams especially during the driest part of a growing season.	Support fish and other aquatic life
Water Quality Maintenance Functions:		
Water Cooling	The effectiveness for maintaining or reducing temperature of downslope waters.	Support cold water fish and other aquatic life
Sediment Retention & Stabilisation	The effectiveness for intercepting and filtering suspended inorganic sediments thus allowing their deposition, as well as reducing energy of waves and currents, resisting excessive erosion, and stabilizing underlying sediments or soil	Maintain quality of receiving waters. Protect shoreline structures from erosion.
Phosphorous Retention	The effectiveness for retaining phosphorus for long periods (>1 growing season)	Maintain quality of receiving waters.
Nitrate Removal and Retention	The effectiveness for retaining particulate nitrate and converting soluble nitrate and ammonium to nitrogen gas while generating little or no nitrous oxide (a potent greenhouse gas).	Maintain quality of receiving waters.
Organic Nutrient Transport	The effectiveness for producing and subsequently exporting organic nutrients (mainly carbon), either particulate or dissolved.	Support food chains in receiving waters.
Ecological (Habitat) Functions:		
Fish Habitat	The capacity to support an abundance and diversity of native fish (both anadromous and resident species)	Support recreational and ecological values.
Aquatic Invertebrate Habitat	The capacity to support or contribute to an abundance or diversity of invertebrate animals which spend all or part of their life cycle underwater or in moist soil. Includes dragonflies, midges, clams, snails, water beetles, shrimp, aquatic worms, and others.	Support salmon and other aquatic life. Maintain regional biodiversity.
Amphibian and Reptile Habitat	The capacity to support or contribute to an abundance or diversity of native frogs, toads, salamanders, and turtles.	Maintain regional biodiversity
Waterbird Feeding Habitat	The capacity to support or contribute to an abundance or diversity of waterbirds that migrate or winter but do not breed in the region.	Support hunting and ecological values. Maintain regional biodiversity.
Waterbird Nesting Habitat	The capacity to support or contribute to an abundance or diversity of waterbirds that nest in the region.	Maintain regional biodiversity.
Songbird, Raptor, and Mammal Habitat	The capacity to support or contribute to an abundance or diversity of native songbird, raptor, and mammal species and functional groups, especially those that are most dependent on wetlands or water	Maintain regional biodiversity.
Native Plant Habitat and Pollinator Habitat	The capacity to support or contribute to a diversity of native, hydrophytic, vascular plant species, communities, and/or functional groups, as well as the pollinating insects linked to them	Maintain regional biodiversity and food chains.
Public Use and Recognition*	Prior designation of the wetland, by a natural resource or environmental agency, as some type of special protected area. Also, the potential and actual use of a wetland for low-intensity outdoor recreation, education, or research.	Commercial and social benefits of recreation. Protection of public investments.

*Considered a benefit rather than a function of wetlands

Source: Adamus (2018)

3.0 Aquatic Habitat and Wetland Assessment Results

As described in the "Wildlife and Wildlife Habitat" Report (Dillon, 2018a), the proposed project area is located within the Valley Lowlands Ecoregion, and specifically within the Anagance Ecodistrict. This area brackets the low-lying Kingston Ecodistrict and is characterized by rugged and bi-partitioned terrain where the landscape is dominated by steep river valleys and ridgetops.

The majority of the proposed project is located within an area that has been extensively used for forestry practices and is dominated by formerly harvested areas (clear-cuts or strip-cuts) that are now in different stages of natural regeneration, or plantations (refer to the "Wildlife and Wildlife Habitat" report [Dillon, 2018a]). The upland vegetation observations made during the field studies within the assessment area can be referenced within the "Vegetation Summary" report [Dillon, 2018b]. In addition to various upland terrestrial habitats, the proposed transmission line extends through various aquatic habitats (i.e. wetlands and watercourses) that are described within the following sections of this report.

The proposed project is situated within the Kennebecasis Watershed (specifically the Upper Kennebecasis subwatershed) which encompasses a drainage area of 1346 square kilometers, beginning at its headwaters in Hamilton Lake and extending to the head of tide at Bloomfield Ridge, NB (KWRC, 2018). The Kennebecasis River (approximately 95 km in length) is the central system within this watershed (KWRC, 2018). The proposed project is situated between Spring Brook (to the west) and Calamingo Brook (to the east). The mapped watercourses that fall within the area of the proposed project include unnamed tributaries of the Kennebecasis River.

3.1 Watercourse Assessment Results

The proposed project (i.e. the assessment area) is located within the upper Kennebecasis River watershed. The GeoNB watercourse mapping (1:10,000) database identified three mapped watercourses within the assessment area that intersect with the proposed transmission line (refer to **Figure 5**), though none of the turbine locations intersect any watercourse (since these locations were selected to avoid encroachment of watercourses). One additional unmapped watercourse associated with an unmapped wetland crossing the transmission line corridor was identified during the field surveys. Finally, a small unmapped watercourse was identified during the field surveys which crosses Mitton Road. The results of the aquatic habitat assessment are summarized in the following sections.

3.1.1 Proposed Turbine Locations

There were no watercourses (mapped or unmapped) identified within the assessment area of any of the proposed turbine locations.

3.1.2 Proposed Transmission Line

The following watercourses, presented on **Figure 5**, were observed within the assessment area surrounding the proposed transmission line:

- **Unnamed Tributary (Dry Channel) - Watercourse 1 (WC 1)**
  WC 1 is a mapped watercourse that was characterized during the field survey as a completely dry, defined channel with steep high banks. Mature riparian forest covers much of the valley channel with little to no shrub layer where it intersects with the proposed transmission line. WC1 is not considered fish habitat due to the lack of substrate and presence of leaf litter. The lack of water and substrate material within the channel suggests that the channel remains dry with no water moving throughout much of the year with the exception of occasional runoff during extreme high flow events or spring freshet.
- **Unnamed Tributary - Watercourse 2 (WC 2)**
  WC2 is a mapped watercourse that was characterized during the field survey as a small drainage stream with a defined channel through an unmapped field-identified wetland (Wetland 1; refer to wetland results in *Section 3.4*). The dominant bank vegetation consisted of grasses, herbaceous vegetation, and shrubs, with a substrate of mainly small gravel. WC2 is considered to be fish habitat, and an unidentified fish was observed during the survey.
- **Unnamed Tributary - Watercourse 3 (WC3)**
  WC3 is an unmapped watercourse that was characterized during the field survey as an intermittent stream with a poorly defined channel associated with an unmapped field-identified wetland (Wetland 2; refer to wetland results in *Section 3.4*). The bank vegetation was sparse, consisting of mainly small herbaceous plants and bare ground. Fish were not observed in WC3 during the field survey.
- **The Kennebecasis River - Watercourse 4 (WC4)**
  The Kennebecasis River (WC4) is a mapped watercourse that was characterized during the field survey as a fish bearing watercourse with riffle, run, and pool habitats. The riparian vegetation consisted of shrubs, grasses, and trees which provide moderate in stream cover for fish.

At the time of the field assessment, an influx of sediment from an unknown source was noted within the channel at the Kennebecasis River bridge crossing located upstream of the assessment area. However, gravel trucks were observed making frequent trips from the active gravel pits in the area. It could not be confirmed if the gravel trucks were the source of the sediment at the time of the field survey. Apart from the observed sedimentation and the surrounding clear-cuts/strip cuts and vegetation management, no other anthropogenic stressors were observed within the assessed watercourses.

3.1.3 Mitton Road Upgrade

The following watercourses were observed within the assessment area surrounding the area of the proposed Mitton Road upgrade:

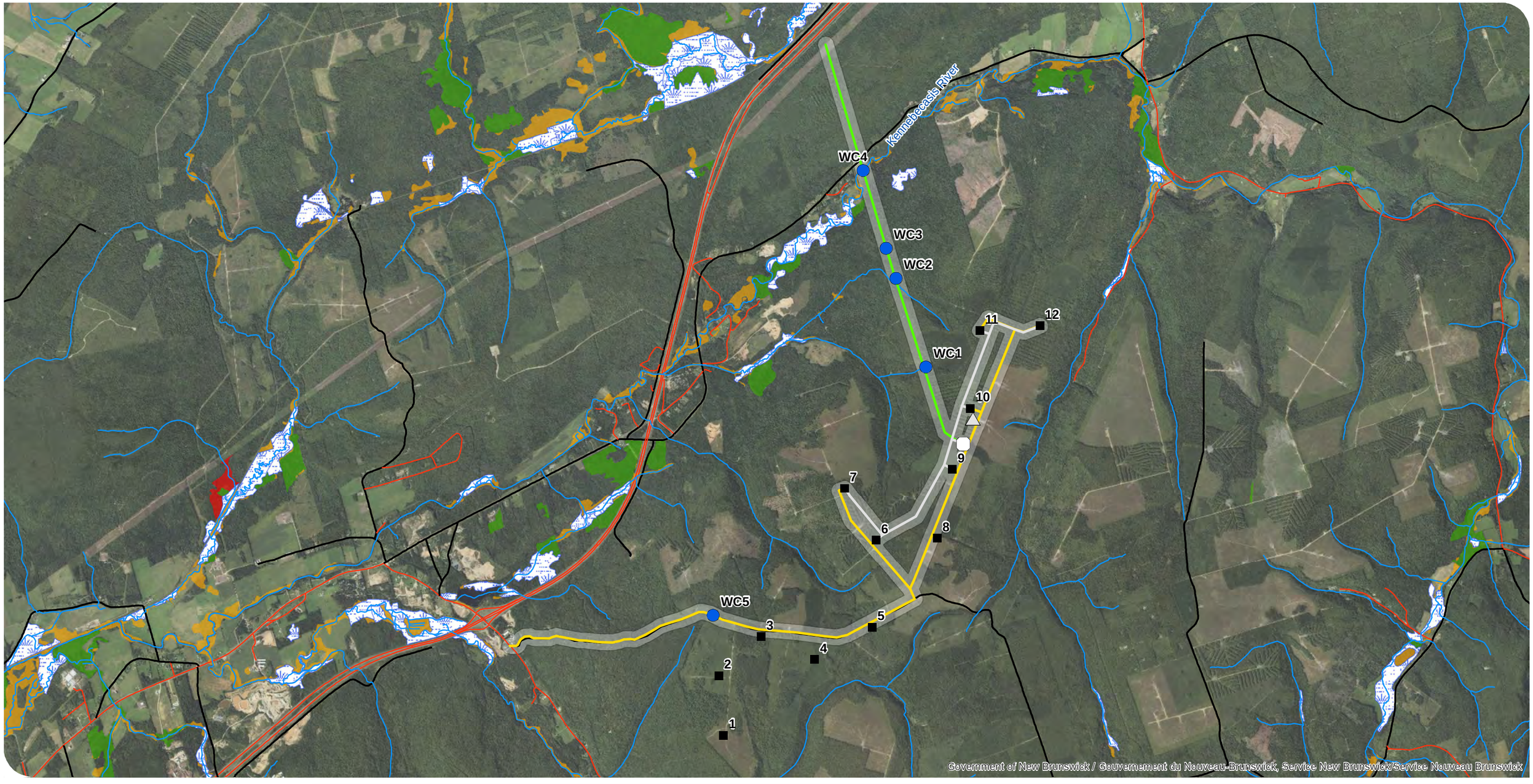
- **Unnamed Tributary (Dry Channel) - Watercourse 5 (WC5)**
  WC5 is an unmapped dry channel that was observed within the assessment area surrounding the Mitton Road upgrade (500 m northwest of the proposed location for Turbine 2) and is characterized as a dry, defined channel with high steep banks. WC5 is not considered fish habitat due to the lack of substrate and presence of leaf litter.

Numerous offtake ditches (drainage channels) were noted along Mitton Road. These ditches were likely installed during the forest road construction to control drainage, erosion and sedimentation, and are not considered fish habitat. They were dry at the time of the field assessment.

3.1.4 Proposed Collector Line and Substation

There were no watercourses (mapped or unmapped) identified within the area of the proposed collector lines or substation.

A summary of the aquatic habitats assessed within the assessment area (i.e. observed within the proposed transmission line and Mitton Road upgrade) is provided in **Table 3**.



NATURAL FORCES TECHNOLOGIES
Wocawson Energy Project

Wocawson Energy

Watercourses
FIGURE 5

Watercourse Crossing
Proposed Turbine Locations
Substation
Met Tower
Collector
Road Upgrade
Proposed Transmission Line
Watercourses

Road Network
Collector
Roads

Assessment Area
Regulated Wetlands

NBDELG Draft Beta Wetland Mapping (unregulated)
Provincially Significant Wetlands
Intermediate Wetlands
Forested Wetlands

DILLON CONSULTING

MAP DRAWING INFORMATION:
DATA PROVIDED BY NBDERD

MAP CREATED BY: SCN
MAP CHECKED BY: ACS
MAP PROJECTION: NAD 1983 CSRS New Brunswick Stereographic

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N W E S

SCALE 1:45,000

FILE LOCATION: G:\CAD\GIS\186975_SUSSEX EAST\SUSSEX EAST WIND PROJECT\MAPS FOR REPORT\WATERCOURSES JULY 17 2018_JNH.MXD

PROJECT: 18-6975 STATUS: DRAFT DATE: 2018-07-17

Table 3: Aquatic Habitat Summary

Watercourse ID	Representative Photo	Average Widths (m)	Dominant Aquatic Habitat Type and Other Observations
Present Along the Proposed Transmission Line			
WC1		**Wet Width:** N/A **Bankfull Width:** 1 m	Mapped ***Dry channel*** (ephemeral drainage channel). No fish habitat observed.
WC2		**Wet Width:** 0.42 m **Bankfull Width:** 0.50 m	**Fish Habitat Suitability:** Small watercourse (mapped) with good riffle/run (fish) habitat associated with Wetland 1. Fish were observed during the field survey. **Dominant Substrate:** 10% Cobble, 70% Gravel, 10% Sand, 10% Silt **Average Depth(s):** 0.09 m – Riffles; 0.20 m – Runs
WC3		**Wet Width:** 0.30 m **Bankfull Width:** 0.50 m	**Fish Habitat Suitability:** Intermittent stream (unmapped) associated with field identified Wetland 2 in softwood forest. Fair fish habitat present (due to the intermittent flow); fish were not observed during the field survey. **Dominant Substrate:** 10% Gravel, 30% Sand, 35% Silt, 25% Detritus **Average Depth(s):** 0.15 m
WC4 (Kennebecasis River)		**Wet Width:** 8.75 m **Bankfull Width:** 9.30 m	**Fish Habitat Suitability:** A fish bearing watercourse (mapped) with riffle, run and pool habitats. **Dominant Substrate:** 10% Boulder, 35% Cobble, 40% Gravel, 5% Sand, 5% Silt **Average Depth(s):** 1.15 m – Pool 0.15 m – Riffle 0.25 m – Run

Watercourse ID	Representative Photo	Average Widths (m)	Dominant Aquatic Habitat Type and Other Observations
Present Along Mitton Road (Proposed Road Upgrade)			
WC5		**Wet Width:** N/A **Bankfull Width:** 0.5 m	Unmapped ***Dry channel*** - ephemeral drainage channel and culvert crossing observed. Fish habitat not observed.

A summary of fish and fish habitat within the watercourses described above is presented in the following section.

3.2 Fish and Fish Habitat Summary

Of the watercourses surveyed within the assessment area, two watercourses (WC2 – small unnamed tributary, and WC4 – Kennebecasis River) were observed to provide habitat for species such as salmonids (i.e., fish species of interest such as Atlantic salmon and brook trout) which require clean, clear and stable gravel substrates for successful spawning (NBDELG, 2012). Salmonids are generally considered cooler water species, and prefer water with a higher dissolved oxygen level (associated with cooler water) when compared to slower moving and warmer bodies of water (CRI, 2015). It should be noted that the technique of backpack electrofishing was considered as a method for conducting fish presence or absence surveys, but was not conducted during the field studies due to the breadth of avaibale literature (i.e. extensive aquatic studies conducted in areas surrounding the proposed project by both the CRI and KWRS). A summary of the fish species that have been historically documented to be present within the Kennebecasis River is provided in **Table 4**, below. For the purpose of this assessment, the Kennebecasis River species assemblage data is inferred to the small unnamed tributary (WC2) where fish were observed (visually) during the field assessment. Based on the aquatic habitat present in WC2, the species observed were likely cyrprinid (minnow) species; and the watercourse was deemed to have the potential to support brook trout (*Salvelinus fontinalis*).

Table 4: Summary of Fish Species Historically Observed within the Kennebecasis River[1]

Common Name	Scientific Name
American Eel[2]	*Anguilla rostrata*
Atlantic Salmon[2]	*Salmo salar*
Brook Trout	*Salvelinus fontinalis*
Common Shiner	*Luxilus cornutus*
Golden Shiner (not abundant at the time of data collection)	*Notemigonus crysoleucas*
Lake Chub (not abundant at the time of data collection)	*Couesius plumbeus*
Sea Lamprey	*Petromyzon marinus*
Slimy Sculpin	*Cottus cognatus*
Threespine Stickleback	*Gasterosteus aculeatus*
White Sucker	*Catostomus commersoni*

Notes:

1. The fish species noted in Table 4 include those species observed during fish population studies conducted by CRI in 2015, at locations adjacent (>100m) to the general study area. Other common fish species in New Brunswick not mentioned in the above table may be present within the Kennebecasis River. The above list is not exhaustive.
2. This species is considered a species of conservation concern (refer to Section 3.3 for details)

3.3 Protected Aquatic Habitat and Aquatic Species at Risk or Species of Conservation Concern

3.3.1 Protected Aquatic Habitat

A custom Atlantic Canada Conservation Data Centre (AC CDC) (2018) data report was obtained for a 5 km radius around the proposed project area. According to the AC CDC records review and desktop analysis, there are no managed, biologically significant, or designated Environmentally Significant Areas (ESA) or Protected Natural Areas (PNA) containing significant or unique aquatic habitat within 5 km of the proposed project area. The nearest PNAs (Class II) that may potentially include significant or unique aquatic habitat include the Picadilly Mountain PNA (located 15 km southwest of the proposed project) and the Cat Road PNA (located 15.5 km southeast) (Natural Forces, 2018).

Although not officially protected, the Kennebecasis River (WC4; refer to the aquatic assessment results in *Section 3.1*) is widely managed by the Kennebecasis Watershed Restoration Committee (KWRC). The KWRC undertakes strategic habitat restoration, educational and advisory initiatives, as well as promotes

public awareness and participation in the restoration of the Kennebecasis River and overall watershed since 1994 (KWRC, 2018). The KWRC is considered an important stakeholder in relation to the proposed project.

WLP has modified the project design such that towers for the transmission line will be located at least 30 m from the identified watercourses, and transmission/collector lines will span watercourses and wetlands between the towers. Due to the spanning of the proposed watercourse and wetland crossings, construction activities related to the development of the proposed transmission line will not occur within the watercourse/wetland or their 30 m buffer. Therefore, the proposed project is not anticipated to adversely affect unique or sensitive aquatic habitat such as the Kennebecasis River (potential habitat for aquatic species at risk).

3.3.2 Aquatic Species at Risk

In this report, we define "species at risk" (abbreviated SAR) as those species that are listed as 'extirpated', 'endangered', or 'threatened' on the federal *Species at Risk Act* (*SARA*) or the New Brunswick *Species at Risk Act* (NB *SARA*). We also define "species of conservation concern" (abbreviated SOCC) as those species that are not SAR but are listed in other parts of *SARA*, NB *SARA*, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), or as regionally rare or endangered by the AC CDC.

According to the AC CDC records review, there are no records of aquatic SAR or SOCC that have been historically observed within 5 km of the proposed project area.

However, according to CRI fish population studies conducted on the Kennebecasis River in 2015, Atlantic salmon (listed as 'endangered' by COSEWIC/*SARA*/NB *SARA*) is an SAR and has been historically observed within the river (refer to **Table 4**). Note that only the inner Bay of Fundy Atlantic salmon population has legal protection under both Schedule 1 of *SARA* as well as under NB *SARA;* the outer Bay of Fundy Atlantic salmon population has been recommended by COSEWIC for listing under *SARA* but has not been so listed yet, and as such, it would be considered an SOCC under *SARA* but a SAR under NB *SARA*. Therefore, given this inconsistency, we conservatively consider Atlantic salmon (regardless of population) to be an SAR for the purpose of this report.

In addition to the aquatic SOCC noted above and as noted in the wildlife and wildlife habitat summary report [Dillon, 2018a), wood turtle is a species at risk of primary interest associated with clear, meandering forested watercourses, farmland and marshland in New Brunswick (ECCC, 2018). The wood turtle was not identified by the AC CDC as having been historically observed within 5 km of the proposed project area (AC CDC, 2018), nor was it observed during the field surveys; however, according to the KWRC, the Kennebecasis River and the other smaller watercourses located within the area may provide potential nesting and feeding habitat for the species (Whalen, B., pers. comm., 2018). Wood turtles were not observed during the field surveys.

Several bird SAR may be associated with aquatic habitats. Refer to the Avian Summary report (Dillon, 2018c) for details of bird SAR present within the area of the proposed project, and their habitat.

Due to the spanning of the proposed watercourse crossings and their 30 m buffers by the proposed transmission line, the proposed project is not anticipated to adversely affect aquatic SAR or their habitat.

3.3.3 Aquatic Species of Conservation Concern

According to the AC CDC records review, there are no records of rare aquatic species or aquatic species of conservation concern or location sensitive species that have been historically observed within 5 km of the proposed project area. Additionally, no aquatic species of conservation concern were observed during the field studies.

The proposed project is thus not anticipated to adversely affect rare aquatic species or aquatic SOCC or their habitat.

However, according to CRI fish population studies conducted on the Kennebecasis River in 2015, American eel (listed as 'threatened' by COSEWIC/NB *SARA*) is an SOCC and has been historically observed within the river (refer to **Table 4**).

Several bird SOCC are associated with aquatic habitats. Refer to the Avian Summary report (Dillon, 2018c) for details of bird SOCC present within the area of the proposed project, and their habitat.

3.4 Wetland Delineation and Functional Assessment Results

There are no mapped wetlands on the GeoNB mapping layer that would intersect with any portion of the proposed project area or assessment area. Three unmapped (non-regulated) wetlands were surveyed, delineated and functionally assessed within the assessment area. **Table 5**, below**,** provides a summary of the identified wetlands. Refer to **Figure 6** for mapped delineations of the field identified wetlands.

Table 5: Summary of Field Identified Wetlands

Wetland ID	Wetland Area[1] (ha)	Location	Wetland Type	Key Ecological Functions[2]
Wetland 1	0.38	Proposed Transmission Line	Treed Swamp	Organic nutrient export, waterbird feeding habitat, songbird, raptor and mammal habitat and pollinator habitat
Wetland 2	1.08	Proposed Transmission Line	Treed Swamp	Phosphorus retention, pollinator habitat and native plant habitat
Wetland 3	4.24	Proposed Transmission Line	Floodplain Shrub Swamp (Associated with WC 4; Kennebecasis River)	Organic nutrient export, anadromous and resident fish habitat, aquatic invertebrate habitat, amphibian and turtle habitat, waterbird feeding and nesting habitat, songbird, raptor and mammal habitat

Notes:

1. The wetland area provided in this table is the surface area of the field identified wetland that is encompassed within the assessment area only (i.e., the surface area of the portion of each wetland that intersects the assessment area, not the entire area of the wetland).
2. Key ecological functions were rated as 'higher' functions during the functional assessment.

Overall, the identified wetlands were characterized as highly fragmented/disturbed riparian wetland (forested) and freshwater marsh/swamp (non-forested wetland) associated with the Kennebecasis River. Plant species diversity within the identified wetlands was observed to be relatively low. Overall, the majority of the plant communities were made up of native species; however, many of the species were indicative of past disturbance (potentially associated with historic agricultural practices or forestry operations). A more detailed summary of the hydrophytic vegetation community assemblage, hydric soil profiles, and hydrological indicators for each field identified wetland is presented below. Refer to the field wetland determination and delineation data sheets in **Appendix A**.

Wetland 1 – Treed Swamp

Based on the results of the field assessment, Wetland 1 is characterized as a 0.38 ha throughflow wetland of natural origin, on a terrene slope that is seasonally flooded and permanently saturated.

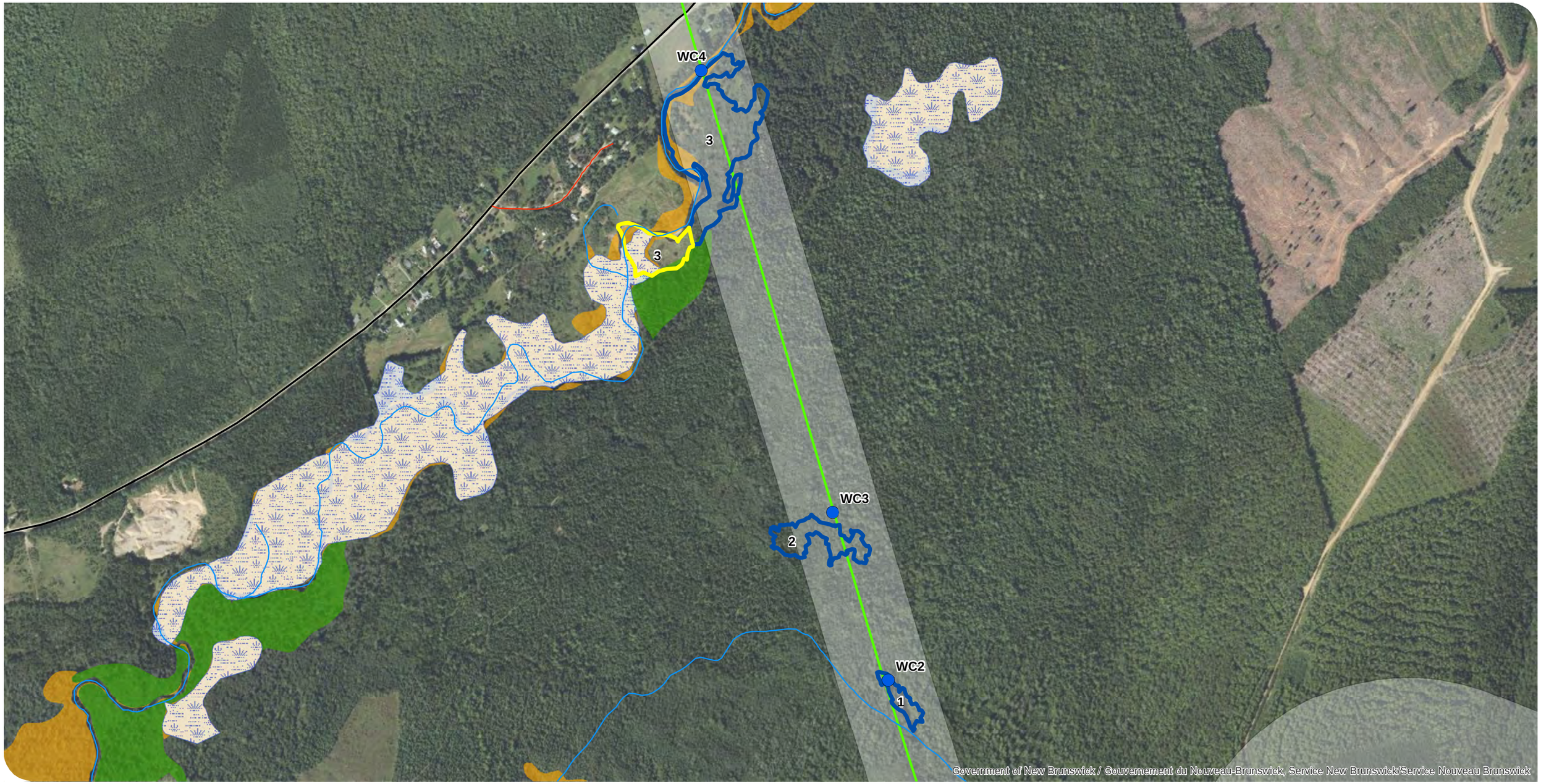
Pre-existing anthropogenic effects may include adjacent clear cutting, former herbicide use, and logging road development. The wetland's primary and secondary indicators and attributes are described as follows:

Dominant Wetland (Hydrophytic) Vegetation:

- Trees (overstory): red maple (*Acer rubrum*, FAC), spruce species (*Picea* spp., FAC);
- Shrubs: speckled alder (*Alnus incana*, FACW); and
- Herbaceous plants (understory): bluejoint reed grass (*Calamagrostis canadensis*, FACW), golden ragwort (*Packera aurea*, FACW), muskflower (*Mimulus moschatus*, OBL), cinnamon fern (*Osmunda cinnamomea*, FAC).

The vegetation community identified at wetland 1 (treed swamp) is considered to be a hydrophytic vegetation community (i.e. >50% wet adapted vegetation).

Primary Wetland Hydrology Indicators Present: Surface water; high water table; saturation; water marks; sediment deposits; drift deposits; sparsely vegetated concave surfaces; water-stained leaves; and aquatic fauna.



NATURAL FORCES TECHNOLOGIES
Wocawson Energy Project

Wocawson Energy
Wetlands
FIGURE 6

Watercourse Crossing
Proposed Turbine Locations
Substation
Met Tower
Collector
Road Upgrade
Proposed Transmission Line
Road Network
Collector
Roads
Watercourses
Assessment
Regulated Wetlands
Delineated Wetlands
Inferred Wetlands Based on Aerial Imagery

NBDELG Draft Beta Wetland Mapping (unregulated)
Provincially Significant Wetlands
Intermediate Wetlands
Forested Wetlands

DILLON CONSULTING

MAP DRAWING INFORMATION:
DATA PROVIDED BY NBDERD

MAP CREATED BY: SCN
MAP CHECKED BY: ACS
MAP PROJECTION: NAD 1983 CSRS New Brunswick Stereographic

0 50 100 200 Meters

SCALE 1:8,000

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FILE LOCATION:
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PROJECT: 18-6975 STATUS: DRAFT DATE: 2018-07-17

Soil Profile:

- 1 – 0" organics;
- 0 – 8" Sandy loam;
    - redox concentrations within matrix and pore linings;
- 8 – 14" Loamy sand: Gleyed (100%); and,
- 14"+ Restrictive Layer: tightly packed sand and gravels.

Hydric Soil Indicators: Sandy gleyed matrix; and sandy redox features.

Overall, based on the results of the WESP-AC functional assessment, Wetland 1 functions highest as bird, mammal and pollinator habitat as well as for organic nutrient export services to downstream aquatic habitats. **Table 6**, below summarizes a rating of the functions provided by Wetland 1.

Table 6: WESP-AC Functional Assessment Scores and Ratings for Field Identified Wetland 1

Wetland Functions or Other Attributes:	Function Score	Function Rating
Surface Water Storage (WS)	2.97	Moderate
Stream Flow Support (SFS)	5.52	Moderate
Water Cooling (WC)	4.79	Moderate
Sediment Retention and Stabilization (SR)	2.67	Moderate
Phosphorus Retention (PR)	1.17	Lower
Nitrate Removal and Retention (NR)	2.47	Lower
Carbon Sequestration (CS)	4.66	Moderate
Organic Nutrient Export (OE)	**7.11**	**Higher**
Anadromous Fish Habitat (FA)	4.98	Moderate
Resident Fish Habitat (FR)	4.89	Moderate
Aquatic Invertebrate Habitat (INV)	5.44	Moderate
Amphibian and Turtle Habitat (AM)	5.41	Moderate
Waterbird Feeding Habitat (WBF)	**6.34**	**Higher**
Waterbird Nesting Habitat (WBN)	4.01	Moderate
Songbird, Raptor, and Mammal Habitat (SBM)	**8.80**	**Higher**
Pollinator Habitat (POL)	**8.68**	**Higher**
Native Plant Habitat (PH)	4.70	Moderate
Public Use and Recognition	2.42	Moderate

Legend: Entries in bold text refer to those wetland functions which are rated as higher for the wetland as compared to other functions.

Wetland 2 – Treed Swamp

Based on the results of the field assessment, Wetland 2 is characterized as a 1.08 ha throughflow wetland of natural origin, within a basin (lotic stream) that is seasonally flooded and permanently saturated. Pre-existing anthropogenic effects may include adjacent clear cutting, former herbicide use, and logging road development. The wetland's primary and secondary indicators and attributes are described as follows:

Dominant Wetland (Hydrophytic) Vegetation:

- Trees (overstory): spruce species (*Picea* spp., FAC); red maple (*Acer rubrum*, FAC); and eastern white cedar (*Thuja occidentalis*, FACW);
- Shrubs: striped maple (*Acer pensylvaticum*, FAC); and speckled alder (*Alnus incana*, FACW); and,
- Herbaceous plants (understory): cinnamon fern (*Osmunda cinnamomea*, FAC); spotted jewelweed (*Impatiens capensis*, FAC); and interrupted fern (*Osmunda claytonia*, FAC).

The vegetation community identified at Wetland 2 (treed swamp) is considered to be a hydrophytic vegetation community (i.e. >50% wet adapted vegetation).

Primary Wetland Hydrology Indicators Present:

Surface water; high water table; saturation; water marks; sediment deposits; sparsely vegetated concave surfaces; water-stained leaves; aquatic fauna; and hydrogen sulphide odour.

Soil Profile:

- 22 – 0" organics
- 0 – 6" Loamy sand: Gleyed
- 6"+ Restrictive Layer: gravels

Hydric Soil Indicators: Histic epipedon; hydrogen sulfide; and sandy gleyed matrix.

Overall, based on the results of the WESP-AC functional assessment, Wetland 2 functions highest as native plant and pollinator habitat as well as provides phosphorous retention (purifying). **Table 7**, below summarizes a rating of the functions provided by Wetland 2.

Table 7: WESP-AC Functional Assessment Scores and Ratings for Field Identified Wetland 2

Wetland Functions or Other Attributes:	Function Score	Function Rating
Surface Water Storage (WS)	2.67	Lower
Stream Flow Support (SFS)	2.29	Lower
Water Cooling (WC)	2.55	Moderate
Sediment Retention and Stabilization (SR)	1.43	Lower
Phosphorus Retention (PR)	**4.13**	**Higher**
Nitrate Removal and Retention (NR)	1.36	Lower
Carbon Sequestration (CS)	4.89	Moderate
Organic Nutrient Export (OE)	5.84	Moderate
Anadromous Fish Habitat (FA)	3.58	Moderate
Resident Fish Habitat (FR)	3.92	Moderate
Aquatic Invertebrate Habitat (INV)	3.98	Lower
Amphibian and Turtle Habitat (AM)	4.38	Moderate
Waterbird Feeding Habitat (WBF)	5.73	Moderate
Waterbird Nesting Habitat (WBN)	3.66	Moderate
Songbird, Raptor, and Mammal Habitat (SBM)	6.99	Moderate
Pollinator Habitat (POL)	**8.98**	**Higher**
Native Plant Habitat (PH)	**5.02**	**Higher**
Public Use and Recognition	2.42	Moderate

Legend: Entries in bold text refer to those wetland functions which are rated as higher for the wetland as compared to other functions.

Wetland 3 – Floodplain Shrub Swamp

Based on the results of the field assessment, Wetland 3 is characterized as a 4.24 ha floodplain shrub swamp of natural origin associated with a lotic river system (the Kennebecasis River), that is seasonally flooded and permanently saturated. Further to the field delineation (4.24 ha), an additional 1.14 ha of Wetland 3 has been inferred based on aerial imagery, as this part of the wetland was located outside of the assessment area (refer to **Figure 6**). Pre-existing anthropogenic effects may include: adjacent clear cutting and herbicide-use; logging road development; historic agricultural uses; and possible historic quarry-use. The wetland's primary and secondary indicators and attributes are described as follows:

Dominant Wetland (Hydrophytic) Vegetation:

- Trees (overstory): willow species (*Salix* spp., FAC);
- Shrubs: chokecherry (*Prunus virginiana*, FAC); and speckled alder (*Alnus incana*, FACW); and,
- Herbaceous plants (undersotry): sensitive fern (*Onoclea sensibilis*, FACW); and shallow-water sedge (*Carex lurida*, OBL).

The vegetation community identified at Wetland 3 (treed swamp) is considered to be a hydrophytic vegetation community (i.e. >50% wet adapted vegetation).

Primary Wetland Hydrology Indicators Present:

Surface water; high water table; saturation; sediment deposits; drift deposits; sparsely vegetated concave surfaces; aquatic fauna; and hydrogen sulphide odour.

Soil Profile:

- 0 – 10" Silt loam
- 10 – 18" Sandy loam
- 18 – 24" Loamy sand
- 24"+ Restrictive Layer: gravels

Hydric Soil Indicators: Sandy gleyed matrix; and sandy redox features.

Overall, based on the results of the WESP-AC functional assessment, Wetland 3 functions highest as bird, mammal, amphibian, turtle and fish habitat as well as for organic nutrient export services to downstream aquatic habitats. **Table 8**, below summarizes a rating of the functions provided by Wetland 3.

Table 8: WESP-AC Functional Assessment Scores and Ratings for Field Identified Wetland 3

Wetland Functions or Other Attributes:	Function Score	Function Rating
Surface Water Storage (WS)	3.51	Moderate
Stream Flow Support (SFS)	5.52	Moderate
Water Cooling (WC)	4.04	Moderate
Sediment Retention and Stabilization (SR)	5.16	Moderate
Phosphorus Retention (PR)	1.23	Lower
Nitrate Removal and Retention (NR)	4.99	Moderate
Carbon Sequestration (CS)	4.58	Moderate
Organic Nutrient Export (OE)	**6.96**	**Higher**
Anadromous Fish Habitat (FA)	**9.93**	**Higher**
Resident Fish Habitat (FR)	**8.49**	**Higher**
Aquatic Invertebrate Habitat (INV)	**7.03**	**Higher**
Amphibian and Turtle Habitat (AM)	**6.72**	**Higher**
Waterbird Feeding Habitat (WBF)	**9.32**	**Higher**
Waterbird Nesting Habitat (WBN)	**6.58**	**Higher**
Songbird, Raptor, and Mammal Habitat (SBM)	**7.48**	**Higher**
Pollinator Habitat (POL)	6.71	Moderate
Native Plant Habitat (PH)	4.50	Moderate
Public Use and Recognition	2.51	Moderate

Legend: Entries in bold text refer to those wetland functions which are rated as higher for the wetland as compared to other functions.

For detailed field results, refer to the wetland delineation field data sheets provided in **Appendix A**.

3.5 Aquatic Habitat – Traditional Knowledge Perspective

The aquatic habitat present within the proposed project area was surveyed from a traditional knowledge perspective by a member of Tobique First Nation (TFN) who accompanied Dillon's biologists during the field surveys. Based on the knowledge of the member of TFN, the proposed project area did not offer unique aquatic habitat or aquatic plant species of special significance to traditional activities or uses.

Traditional activities such as fishing and trapping that may occur within the Kennebecasis River could continue in the area subsequent to the development of the proposed project.

This report focuses on aquatic habitat only and should not be considered a traditional land use study. For details surrounding the known traditional uses (based on interviews and knowledge of the TFN team member) of plant or wildlife species located within the project area, please refer to the summary report for rare plants and baseline vegetation and wildlife and wildlife habitat.

4.0 Assessment of Potential Environmental Interactions

The identification of potential interactions between the Project and the aquatic habitat (including wetlands) has been undertaken in consideration of the nature of the Project, its planned activities, as well as potential accidental events/malfunctions.

4.1 Identification of Project Interactions

4.1.1 Approach to Project Components and Project Interaction Matrix

As presented in Section 1.1.3, this assessment recognizes four main distinct Project phases. The potential interactions with the surrounding environment have been considered in terms of each distinct phase. Additionally, accidents and malfunctions will be considered.

The phases of the Project include:

1. *Development Phase;*
2. *Pre-Construction Phase;*
3. *Construction Phase; and,*
4. *Operation Phase.*

This initial screening (i.e., project interaction matrix) assists in determining if an interaction between the activities being carried out in each phase of the proposed project and the valued component is possible. The matrix is presented below in **Table 9**.

Table 9: Project Interactions with Environmental Components

Valued Components	Project Phases				
	Development Phase	Pre-Construction Phase	Construction Phase	Operation Phase	Accidents and Malfunctions
Aquatic Habitat (including wetlands)			✓		✓

Legend: ✓ = Potential interaction identified

Those project phases for which a checkmark is provided indicates that the project may interact with the VC, and thus an environmental effects assessment is warranted in Section 4.2 below.

Those project phases for which no interaction was noted with the VC (namely the development, pre-construction, and operation phases) are not carried forward or discussed further in this report. Aquatic habitat will not interact with the development and pre-construction phases of the proposed project due to the conceptual, planning, administrative, and design nature of these phases. Since there are no "on the ground" activities associated with these phases, no environmental effects are expected to result and therefore no interaction is anticipated. Though effects on aquatic habitat (including wetlands) will persist through the operation phase until the end of the project life, those effects on aquatic habitat are the same as would have occurred during the construction phase, and in the interests of not double-counting the same effect during two phases, no new interaction is therefore expected during the operation phase.

As described in Section 1.1.3, the decommissioning phase of the project is not considered within the scope of this assessment; a decommissioning plan will be completed prior to this phase of the project that reflects the guidance and regulations of the time.

4.2 Assessment of Residual Environmental Effects

4.2.1 Identification of Potential Environmental Effects

Without mitigation, the proposed project could interact with aquatic habitat (including wetlands) and cause environmental effects in the following ways:

- Construction in the areas of the wetlands and watercourses may require clearing or road construction. This could increase erosion rates or alter natural drainage patterns in proximity to the aquatic receptors;
- Loss of wetland area or function(s) (such as hydrological regime, habitat and water quality maintenance) could occur due to clearing of trees and vegetation within the wetland(s);
- Increased erosion rates from clearing may affect fish habitat from an increase in sediment load; and
- A spill or fire could occur as an accident or unplanned event which could affect the water quality and fish habitat in the aquatic environment.

4.2.2 Standard Mitigation of Potential Environmental Effects

Mitigation is identified for each interaction and/or effect in relation to the terrestrial environment in an attempt to prevent the interaction from occurring if possible, or to reduce the severity, magnitude, geographic extent, frequency, or duration of the interaction. Best management practices (based on industry guidelines and regulatory guidance documents) have been identified as appropriate mitigative measures. In addition, several acts, codes, regulations and guidelines may require appropriate actions be conducted as mitigative measures prior to or during the interaction.

The federal and provincial legislation and codes that could apply to the proposed Project include (but may not be limited to):

- *Canadian Environmental Protection Act* and regulations ;
- *Fisheries Act*;
- *Species at Risk Act*;
- The *Federal Policy on Wetland Conservation*;
- *Transportation of Dangerous Goods Act*, and regulations;
- New Brunswick *Clean Environment Act*, and regulations;
- New Brunswick *Clean Water Act*, and regulations;
- New Brunswick *Occupational Health and Safety Act*, and regulations; and
- New Brunswick *Species at Risk Act* and regulations.

The following standard mitigation measures have been identified to reduce the likelihood of occurrence, or minimize potential extent of effects of the Project on aquatic habitat (including wetlands). Planned standard mitigation measures for the proposed project include the following:

- Where possible, avoid construction within 30 m of watercourses or wetlands;
- Construct the transmission line and collector lines such that the transmission towers span watercourses and wetlands including their 30 m buffers, where possible;
- The area of disturbance associated with the development of the physical components of the proposed project (e.g., turbines, transmission line) will be minimized to the extent possible to limit the associated environmental effects associated with such disturbance;
- Proper erosion and sediment control measures will be installed and checked regularly and prior to and after storm events to ensure they are continuing to operate properly to minimize potential effects to adjacent habitat;
- Exposed soils will be stabilized as soon as practical to minimize emissions of particulate matter, erosion, and the release of sediment-laden runoff;
- A plan for handling fill and construction materials for the site will be communicated to the contractor (i.e., if stockpiling is required, materials will be stored away from any watercourse or wetland in pre-defined areas or removed from site to a pre-determined location) with the goal of minimizing the amount of soil stockpiled, and duration that soil is stockpiled, at the site;
- The contractor will be required to provide spill response training to construction personnel and will ensure that spill response equipment is readily available on-site, and each piece of machinery is equipped with a spill response kit; and
- Remedial action, or engineered controls, for any spills or leaks that occur will be completed.

A list of mitigation measures related to specific phases of the project (as outlined in Section 1.1.3) is provided in **Table 8**.

4.2.3 Characterization of Residual Environmental Effects

Table 10 identifies the potential environmental effects that may occur to aquatic habitat (including wetlands), identifies proposed mitigation, and discusses residual environmental effects after mitigation has been applied.

With planned mitigation and key design and construction considerations such as avoiding in-water work and avoiding any disturbance within 30 m of a watercourse or wetland, any residual effects on aquatic habitat that may occur as a result of the construction phase of the project are expected to be of low magnitude and be reversible in nature. The spatial extent of potential residual effects on aquatic habitat (including wetlands) is also anticipated to be limited to the project site, and limited to the construction period of 1 year. Therefore, any potential residual effects on aquatic habitat are not considered to be significant.

With the implementation of planned mitigation, and with the careful development and implementation of contingency and emergency response plans to be applied, impacts posed by accidents and unplanned events related to the Project and aquatic are not expected to be substantive.

Table 10 - Potential Environmental Effects of the Proposed Project on Aquatic Habitat (Including Wetlands)

Project Phase	Potential Environmental Effect	Mitigation	Characterization of Residual Environmental Effects	Anticipated Significance of Residual Environmental Effects
Aquatic and Wetland Environment				
Construction Phase	• Clearing and grubbing of vegetation may erosion rates. • Clearing and grubbing of vegetation may increase sediment loading in aquatic receptors. • Clearing, grubbing of vegetation and access road construction may alter natural drainage patterns. • Potential loss of wetland function due to clearing and grubbing.	**In addition to the standard mitigation measures provided in Section 4.2.2, the following mitigative measures will be employed to reduce the environmental effects to aquatic habitat quality in the area of the Project prior to and during the construction phase of the project.** • Where possible avoid construction within 30 m of watercourses or wetlands; • Watercourse and Wetland Alteration Permits will be obtained for any work within 30 m of watercourses or wetlands and outlined conditions will be followed; • The area of disturbance associated with the development of the physical components of the proposed project (e.g., turbines, transmission line) will be minimized to the extent possible to limit the associated environmental effects associated with such disturbance; • Existing access roads will be utilized where possible to reduce the area od disturbance; • Disturbed areas not required for project operation will be revegetated using an approved seed mix as soon as feasible; • Proper erosion and sediment control measures will be installed and checked regularly and prior to and after storm events to ensure they are continuing to operate properly to minimize potential effects to adjacent habitat; • Exposed soils will be stabilized as soon as practical to minimize emissions of particulate matter; • Erosion control measures will be removed following the completion of the construction phase; • A plan for handling fill and construction materials for the site will be communicated to the contractor (i.e., if stockpiling is required, materials will be stored away from any watercourse or wetland in pre-defined areas or removed from site to a pre-determined location) with the goal of minimizing the amount of soil stockpiled, and duration that soil is stockpiled, at the site; • Construction material and construction debris will be stored more than 30m from water courses and wetlands. • At minimum, baseline in-situ water quality parameters will be collected in all watercourses (with the exception of dry seasonal drainage channels) present within the area of the proposed project prioir to site development/construction.	<u>Characterization of Residual Environmental Effects:</u> Magnitude: Low Spatial Extent: Immediate (limited to project site) Duration: Short term – Construction period (1 year) Frequency: Moderate Reversibility: Reversible <u>Overall Summary:</u> With the implementation of planned mitigation, interactions between the Project and aquatic habitat (including wetlands) during the construction phase of the Project are not expected to be substantive.	Not significant
Accidents, Malfunctions, and Unplanned Events	• There is a potential for unplanned releases related to any construction project that could affect the water quality in the aquatic receptors. • There is a potential for loss of vegetation due to fires that could affect the function of the wetland.	**In addition to the standard mitigation measures provided in Section 4.2.2, the following mitigative measures will be employed to reduce the environmental effects to aquatic habitat quality in the area of the Project prior to and during the construction and operation phases of the project.** • Any spills or leaks that occur will be reported to the appropriate regulatory authorities, if applicable, as soon as possible; • Remedial action, or engineered controls, for any spills or leaks that occur will be completed; • Refueling, oiling, and maintenance of equipment will be completed at least 30 m away from any watercourse or wetland to minimize potential effects that could arise in the event of a spill; • Major servicing of equipment will be completed off-site by a licensed mechanic when possible; • Chemicals and petroleum hydrocarbons will be stored in appropriate containers and in specifically designated areas. Where applicable, secondary containment of chemicals or petroleum hydrocarbons will be employed; • Work entailing use of toxic or hazardous materials, chemicals, or otherwise creating hazard to life, safety of health, will be conducted in accordance with National Fire Code of Canada to minimize the potential for spills or fires; and, • Rubbish and waste materials will be kept at minimum quantities and burning of this material will be prohibited; and • The Contractor will ensure that there is basic fire-fighting equipment available on-site and all personnel will be familiar with the equipment and equipment location the event of an accidental fire.	<u>Characterization of Residual Environmental Effects:</u> Magnitude: Low Spatial Extent: Immediate (limited to project site) Duration: Short term Frequency: Low Reversibility: Reversible <u>Overall Summary:</u> With the implementation of planned mitigation, and with the careful development and implementation of contingency and emergency response plans to be applied in the unlikely occurrence of an accident, malfunction, or unplanned event, interactions between the Project and aquatic habitat (including wetlands) arising from an accidental event during construction and/or operation and maintenance are not expected to be substantive.	Not significant

Note: As noted within section 4.1.1, the Decommissioning Phase of the proposed project is not included within the scope of this assessment.

5.0 Summary and Conclusion

This report has been prepared for the construction and operation of the Wocawson Energy Project. The proposed project is expected to provide renewable electricity to approximately 3,600 – 7,200 New Brunswick homes and support New Brunswick Power in attaining their future renewable energy targets.

The information provided in this document is based on the current available design/planning information and existing environment information obtained during focused field surveys conducted in June and July 2018. The applicable environmental components and potential project environmental effects were assessed and presented with meaningful mitigation measures to minimize, and in some cases eliminate, the potential effects. Based on these interactions, it can be concluded that, with the proper mitigation and standard operating procedures as outlined in this document, the residual environmental effects of the project are anticipated to be not significant for the project phases.

6.0 Closure

This report was prepared by Dillon Consulting Limited (Dillon) on behalf of the Wocawson Energy Limited Partnership, in support of the Wocawson Energy Project EIA. Dillon has used the degree of care and skill ordinarily exercised under similar circumstances at the time the work was performed by reputable members of the environmental consulting profession practicing in Canada. Dillon assumes no responsibility for conditions which were beyond its scope of work. There is no warranty expressed or implied by Dillon.

The material in the report reflects Dillon's best judgment in light of the information available to Dillon at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Dillon accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Yours truly,

DILLON CONSULTING LIMITED

Kristin Banks, P.Eng.

Project Manager

Appendix A

Field Data Sheets

WETLAND DELINEATION DATA FORM – ~~NOVA SCOTIA~~ NB

Project/Site: Wocawsom Wind - Sussex East Municipality/County: Kings County, NB Sampling Date: June 26th/18

Applicant/Owner: Natural Forces Sampling Point: WL #1

Investigator(s): Chris Kennedy, Julie Henderson, Deborah Beal Affiliation: Dillon Consulting

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

Slope (%): ✓ Lat: ~ Long: ~ Datum: ~

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

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

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

Are Vegetation No, Soil No, or Hydrology No 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 ____	If yes, optional Wetland Site ID: Wetland #1
Wetland Hydrology Present?	Yes ✓	No ____	

Remarks: (Explain alternative procedures here or in a separate report.)
Steep-sided intermittent watercourse flattens out allowing water to spread + braid creating a wooded swamp.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10 m r)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	25	✓	FAC
2. Thuja occidentalis	5		FACW
3. Abies balsamea	5		FACW
4. Betula alleghaniensis	5		FAC
5. Picea spp	20	✓	FAC
	60	= Total Cover	

Sapling/Shrub Stratum (Plot size: 5 m radius)			
1. Actaea rubra	3		FAC
2. Acer pensylvaticum	+		FACU
3. Alnus incana	35	✓	FACW
4. Corylus cornuta	2		FAC
5. Nemopanthus mucronatus	5		FAC
	45	= Total Cover	

Herb Stratum (Plot size: 2 m radius)			
1. Osmunda cinnamomea	15	✓	FAC
2. Athyrium Filix-femina	2		FAC
3. Rubus hispidus	3		FACW
4. Dryopteris cristata	+		FACW
5. Packera aurea	15	✓	FACW
6. Mimulus moschatus	15	✓	OBL
7. Carex lurida	2		OBL
8. Geum macrophyllum	3		FACW
9. Calamagrostis canadensis	20	✓	FACW
10. Chrysosplenium americanum	+		OBL
	75	= Total Cover	

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

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 7 (A)

Total Number of Dominant Species Across All Strata: 7 (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	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A =

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: WL #1

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
1-0	Muck/Organics						Organics	
0-8	10YR 3/2	95	5YR 4/6	5	C	PL/M	Sandy Loam - quite coarse	
8-14	Gley 1 3/10Y	100					Loamy Sand/+ gravels	
14+	Refusal							

[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)
- ✓ Sandy Gleyed Matrix (S4)
- ✓ Sandy Redox (S5)
- ___ Polyvalue Below Surface (S8)
- ___ Thin Dark Surface (S9)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Iron-Manganese Masses (F12)
- ___ Piedmont Floodplain Soils (F19)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

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

Restrictive Layer (if observed):

Type: Gravels

Depth (inches): 14+

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): 3-4 inches

Water Table Present? Yes ✓ No ___ Depth (inches): @ surface

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

Wetland Hydrology Present? Yes ✓ No ___

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

Remarks:

WETLAND DELINEATION DATA FORM – ~~NOVA SCOTIA~~ NB

Project/Site: Wocawson Wind - Sussex East Municipality/County: Kings County, NB Sampling Date WL #2

Applicant/Owner: Natural Forces Sampling Point: WL#2

Investigator(s): Chris Kennedy, Julie Henderson, Deborah Beer Affiliation: Dillon Consulting

Landform (hillslope, terrace, etc.): Lotic stream basin Local relief (concave, convex, none): none

Slope (%): ✓ Lat: ✓ Long: ✓ Datum: ✓

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

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

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

Are Vegetation No, Soil No, or Hydrology No 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 _____	If yes, optional Wetland Site ID: Wetland #2
Wetland Hydrology Present?	Yes ✓	No _____	

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

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10 m radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Thuja occidentalis	15	✓	FACW
2. Acer rubrum	25	✓	FAC
3. Picea spp	30	✓	FAC
4. Fraxinus americana	5		FAC
5. Betula papyrifera	5		FACU
	80	= Total Cover	

Sapling/Shrub Stratum (Plot size: 5 m radius)			
1. Cornus alternifolia	5	✓	FAC
2. Acer pensylvaticum	15	✓	FAC
3. Actaea rubra	+	✓	FAC
4. Alnus incana	10	✓	FACW
5. Abies balsamea	+		FAC
	30	= Total Cover	

Herb Stratum (Plot size: 2 m radius)			
1. Impatiens capensis	10	✓	FAC
2. Osmunda cinnamomea	20	✓	FAC
3. Ranunculus repens	5		FAC
4. Geum macrophyllum	1		FACW
5. Arisaema triphyllum	2		FACW
6. Rubus hispidus	5		FACW
7. Geum allepicum	1	✓	FAC
8. Osmunda claytonia	10	✓	FAC
9. Carex intumescens	1		FAC
10. Carex lurida	+		OBL
	55	= Total Cover	

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

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 8 (A)

Total Number of Dominant Species Across All Strata: 8 (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	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals:	(A)	(B)

Prevalence Index = B/A = _____

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: WL#2

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
22-0	Organics						Organics	/ Muck (Black)
0-6	Gley 1 3/10Y	100					Silty Sand	
6+	Refusal						Gravels?	

[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)
- √ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Polyvalue Below Surface (S8)
- ___ Thin Dark Surface (S9)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Iron-Manganese Masses (F12)
- ___ Piedmont Floodplain Soils (F19)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

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

Restrictive Layer (if observed):

Type: Unknown - Gravels?

Depth (inches): 6+

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): 1-2 inches

Water Table Present? Yes √ No ___ Depth (inches): @ surface

Saturation Present? (includes capillary fringe) Yes √ No ___ Depth (inches): @ surface

Wetland Hydrology Present? Yes √ No ___

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

Remarks:

WETLAND DELINEATION DATA FORM – ~~NOVA SCOTIA~~ NB

Project/Site: Wocawson Wind-Sussex East Municipality/County: Kings County, NB Sampling Date: July 5/18

Applicant/Owner: Natural Forces Sampling Point: WL#3

Investigator(s): Chris Kennedy + Deborah Bear Affiliation: Diller Consulting

Landform (hillslope, terrace, etc.): Lotic River – Floodplain Local relief (concave, convex, none): concave

Slope (%): — Lat: — Long: — Datum: —

Soil Map Unit Name/Type: — Wetland Type: Floodplain / Shrub Swamp

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

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

Are Vegetation No, Soil No, or Hydrology No 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 ____	If yes, optional Wetland Site ID: Wetland #3
Wetland Hydrology Present?	Yes ✓	No ____	

Remarks: (Explain alternative procedures here or in a separate report.)
Adjacent upland is disturbed – apple trees, old field forest, possible old pasture land
However upland/wetland edge is apparent

VEGETATION – Use scientific names of plants

Tree Stratum (Plot size: 10 m radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix spp	30	✓	FAC
2. Acer rubrum	+		
3.			
4.			
5.			
	30	= Total Cover	

Sapling/Shrub Stratum (Plot size: 5m radius)			
1. Alnus incana	20	✓	FACW
2. Prunus virginiana	60	✓	FAC
3. Salix spp	5		FAC
4.			
5.			
	85	= Total Cover	

Herb Stratum (Plot size: 2 m radius)			
1. Onoclea sensibilis	80	✓	FACW
2. Geum macrophyllum	+		FACW
3. Myosotis laxa	+		OBL
4. Carex lurida	5		OBL
5. Galium palustre	+		FACW+
6. Scutellaria lateriflora	+		FACW
7. Arisaema triphyllum	+		FACW
8. Glyceria melicaria	+		OBL
9. Urtica dioica ssp gracilis	+		FACW
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: 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	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A = ____

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.)
WL pit ⇒ WP 524 CK

SOIL

Sampling Point: WL#3

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
0-10	10YR 3/1	100					Silty-Loam to Sandy, mucky	
10-18	10YR 4/1	100					Sandy-loam	mc/c sand
18-24	10YR 4/1	100					Loamy Sand	
24+	Refusal						Gravels	

[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)
- ___ Sandy Gleyed Matrix (S4)
- ✓ Sandy Redox (S5)
- ✓ Polyvalue Below Surface (S8)
- ___ Thin Dark Surface (S9)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Iron-Manganese Masses (F12)
- ___ Piedmont Floodplain Soils (F19)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

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

Restrictive Layer (if observed):

Type: Gravels

Depth (inches): 24+

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): 8-10 inches

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

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): @ surface

Wetland Hydrology Present? Yes ✓ No ___

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

Remarks: Many Back channels

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PERSONAL COMMUNICATIONS

Whalen, Ben. Personal communication, July 6, 2018. Project manager, Kennebecasis Watershed Association).