Blue Hill Wind Energy Project

Technical Project Proposal

Prepared for:
Algonquin Power
354 Davis Road
Oakville, ON L6J 2X1

Prepared by:
Stantec Consulting Ltd.
100-75 24th Street East
Saskatoon, SK S7K 0K3

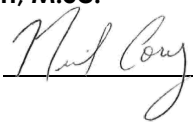
March 24, 2017

Sign-off Sheet

This document entitled Blue Hill Wind Energy Project was prepared by Stantec Consulting Ltd. ("Stantec") for the account of Algonquin Power (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by 
(signature)

Chantal Eidem, M.Sc.

Reviewed by 
(signature)

Neil Cory, M.E.Des.

Reviewed by 
(signature)

George Hegmann, M.E.Des., P.Eng.

Table of Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

Executive Summary

Introduction

Algonquin Power (Algonquin) is proposing to construct the Blue Hill Wind Energy Project (the Project), a 177 MW facility located in southern Saskatchewan. Algonquin has extensive project development experience in the wind industry, including in a prairie environment, and has used that experience to plan this Project.

Typically, as part of the development of the Project and regulatory process, the Project would be subject to review by the Saskatchewan Ministry of Environment (SKMOE) Environmental Assessment Branch to determine if the Project is considered a "development" under the Saskatchewan *Environmental Assessment Act*. However, Algonquin has chosen to "opt in" to the environmental assessment process (i.e., self-declare that the Project is a development) and forgo a Ministerial Determination for the Project. To begin the regulatory review process for the Project, and as recommended by SKMOE during a conference call on December 19, 2016, Algonquin has developed this Technical Project Proposal (TPP) and draft Terms of Reference (TOR) (Appendix A) for review. The purpose of this document is to give SKMOE information about the Project, its location, and scoping of issues to be assessed as part of the environmental assessment process, as described in the draft TOR. The TPP provides a high-level discussion of potential effect pathways and mitigation measures for those environmental components that are most likely to be affected by the Project.

Project Description

The Project is located approximately 7 km south of Herbert, SK, and will consist of approximately 42 to 88 wind turbine generators (WTGs) (depending on the selected turbine type) and associated infrastructure, laydown area(s), including roads and electrical collector lines. Each WTG will have a capacity between 2.0 and 4.2 MW; the final WTG selection will be influenced by several factors, including specific parameters of the local wind regime and economic (market and debt-financing) considerations at the time of procurement. The Project Area encompasses 470 quarter sections; however, approximately only 42 to 110 quarter sections are expected to be used for the Project layout. This estimate of quarter sections and the number of WTGs may change as the Project layout is refined and finalized. It should be noted that the Project will not disturb entire quarter sections; only small amounts of land within each quarter section will be used to accommodate Project infrastructure such as WTGs, access roads and collector lines. Construction of the Project is anticipated to begin in 2019 and commissioned in 2020.

Project components include WTGs, electrical collector lines, permanent access roads, maintenance and storage facilities, laydown area(s) and temporary workspaces. Construction activities will include site preparation, foundation excavation, assembly of each WTG, installation

of underground collector lines, building access roads and post-construction cleanup and reclamation.

The Project will operate year-round, except in unfavourable wind conditions (WTGs will automatically shut down) or if there is an operational problem or maintenance is required. Routine maintenance activities are typically scheduled every six months (depending on manufacturer's requirements) and include checking hydraulic hoses, electrical components, fittings, test equipment, gauges and lubricants. The estimated service life of the Project is 25 years, at which time, the Project may be upgraded to extend the energy-production lifespan of the Project, or decommissioned. If the Project is decommissioned, activities will include equipment dismantling and removal, and reclamation of the site to pre-development conditions.

Existing Conditions

The Project is located within the Mixed Grassland ecoregion. The majority of the Project Area consists of moderate or gentle slope classes that would not limit Project construction. Soils in the Project Area are primarily of the Chernozemic soil order and most have a Class 4 (i.e., severe limitations) soil agricultural capability rating, with moisture being the most common limiting factor.

The majority of the Project Area consists of cultivated land (70.4%), interspersed with tame pasture (13.1%), native grassland (7.8%), and hayland (4.8%). Native grassland is mainly found throughout the western portion of the Project Area and generally consists of smaller remnant patches associated with areas less suitable for crop production (e.g., Hill and ephemeral drainage coulees). Wetlands and water combined represent less than 2% of the landscape in the Project Area; this percentage will be field verified. There are no historical occurrences of plant species of management concern (SOMC) in the Project Area, according to the Saskatchewan Conservation Data Centre (SKCDC) database.

Areas of natural land cover (e.g., native grassland, pasture, wetlands) within the Project Area may provide suitable habitat to a variety of wildlife species, including SOMCs such as Sprague's pipit (*Anthus spragueii*), burrowing owls (*Athene cunicularia*), and chestnut-collared longspur (*Calcarius ornatus)*. No designated lands occur within the Project Area. There are nine historical occurrences of wildlife SOMC in the SKCDC database, six of which consisted of ferruginous hawk (*Buteo regalis*).

Within the Project Area boundary, 202 quarter sections were identified as heritage sensitive. As well, there are four recorded heritage resources including two artefact/feature combinations, one artefact scatter and one possible burial (which is designated as a Site of Special Nature). Should Project infrastructure be sited on heritage sensitive land, a referral will be submitted to HCB to determine if an HRIA is required.

The Project is located in the Rural Municipalities of Morse (No. 165) and Lawtonia (No. 135). Communities in proximity to the Project Area include Herbert, Morse, Hodgeville, and Swift Current. The Project is located in an agricultural environment and existing infrastructure within the Project Area includes transmission lines and a network of grid roads.

Effects Assessment and Mitigation

A high-level discussion of potential effect pathways and mitigation measures is provided for each component. Details on the approach used for the assessment of Project-specific and cumulative effects are provided in the TOR (Appendix A).

The Project is not expected to affect terrain integrity, and with mitigation, residual effects on soil quality quantity are not expected. Due to the absence of fish-bearing waterbodies or watercourses in the Project Area, no further assessment of aquatic resources was deemed necessary for the Project as there is no potential for Project effects to occur.

The potential effects pathways on Vegetation and Wetlands include a change in native vegetation and wetland abundance, and a change in plant SOMC abundance and distribution. It is expected that these effects can be reduced or avoided through proper siting of infrastructure and appropriate mitigation measures, but residual effects may still occur depending on the Project layout. The extent of potential effects on vegetation and wetlands will be assessed further in the Environmental Impact Statement (EIS), as outlined in the TOR (Appendix A). The Project may result in effects to wildlife through direct (e.g., removal of habitat) and indirect (e.g., sensory disturbance) changes in habitat availability or through a change in mortality risk. The extent of these potential effects will also be assessed in the EIS, as outlined in the TOR (Appendix A).

Changes to heritage resources may occur during construction through ground disturbance and can be appropriately mitigated prior to construction by conducting a Heritage Resource Impact Assessment (HRIA). To fulfill the requirements of the *Heritage Property Act*, all heritage resources must be avoided or mitigated fully under the direction of the Heritage Conservation Branch (HCB). If an archaeological site is unavoidable, mitigation measures will be determined by HCB and may range from site sampling to full scale excavation.

Potential effects on the human environment include a positive effect on employment, an increase in demand on local and regional services, local economic benefits, and a change in land use. The extent of these potential effects will be assessed in the EIS, as outlined in the TOR (Appendix A).

The Project will use proven and accepted mitigation measures for wind energy projects in Saskatchewan, and across Canada. Algonquin is committed to incorporating environmental management approaches and strategies into Project planning and execution so that the Project is compliant with regulatory requirements and avoids or reduces potential negative effects to the environment. The incorporation of environmental management tools into Project

planning and execution will occur in several ways, including in the design and location of Project components, consulting with provincial regulators and stakeholders to better understand the issues that are of most concern to them, avoidance or mitigation of potential effects on remaining natural features (include committing to conducting pre-construction surveys), and through development of an environmental protection plan.

Abbreviations

AAFC	Agriculture and Agri-Food Canada
BSC	Bird Studies Canada
CI	confidence interval
CLI	Canada Land Inventory
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
DP	decommissioning plan
DFO	Fisheries and Oceans Canada
EIS	Environmental Impact Statement
EPP	Environmental Protection Plan
ha	hectare
HCB	Heritage Conservation Branch
HRIA	Heritage Resource Impact Assessment
IBA	Important Bird Area
km	kilometer
kV	kilovolt
m	meter
MBCA	Migratory Bird Convention Act
MET	meteorological tower
MW	megawatt
NTS	National Topographic System
O&M	operation and maintenance

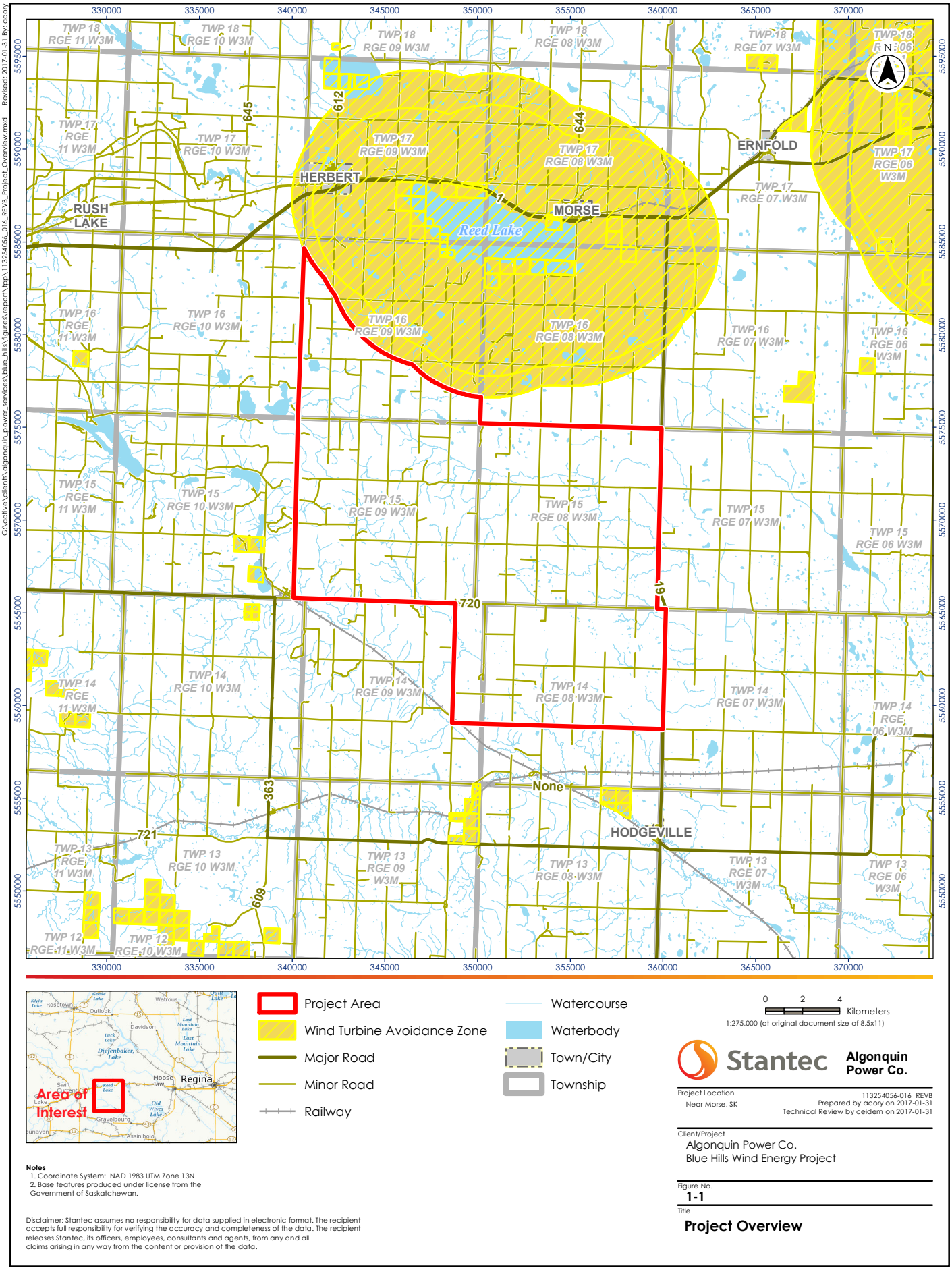
RM	rural municipality
ROW	right-of-way
SARA	Species at Risk Act
SCADA	Supervisory Control and Data Acquisition
SK	Saskatchewan
SKCDC	Saskatchewan Conservation Data Centre
SKMOE	Saskatchewan Ministry of Environment
SKSID	Saskatchewan Soil Information Database
SOMC	species of management concern
SOP	Standard Operating Procedure
TOR	Terms of Reference
WHPA	Wildlife Habitat Protection Act
WTG	wind turbine generator

1.0 INTRODUCTION

Algonquin Power (Algonquin) is proposing to construct the Blue Hill Wind Energy Project (the Project), a 177 MW facility located approximately 7 km south of Herbert, SK (Figure 1-1). The Project will consist of approximately 42 to 88 wind turbine generators (WTG), depending on the selected turbine type, and associated infrastructure, including roads and electrical collector lines. The number of WTGs could be altered as the Project layout is finalized.

Typically, as part of the development of the Project and regulatory process, the Project would be subject to review by the Saskatchewan Ministry of Environment (SKMOE) Environmental Assessment Branch to determine if the Project is considered a "development" under the Saskatchewan *Environmental Assessment Act*. However, it is Algonquin's request to "opt in" to the formal environmental assessment process (i.e., self-declare that the Project is a development) and forgo a Ministerial Determination for the Project. As discussed via conference call with SKMOE Environmental Assessment Branch representatives on December 19, 2016, this was confirmed as being an option to Algonquin.

To begin the regulatory review process for the Project, and as recommended by SKMOE, Algonquin is submitting this Technical Project Proposal (TPP) and draft Terms of Reference (TOR) (Appendix A) for review. The purpose of this document is to give SKMOE information about the Project, its location, and scoping of issues to be assessed as part of the environmental assessment process, as described in the draft TOR (Appendix A). Additional details on the description of the Project and potential issues are provided in this document.



- Project Area
- Wind Turbine Avoidance Zone
- Major Road
- Minor Road
- Railway
- Watercourse
- Waterbody
- Town/City
- Township

0 2 4 Kilometers

1:275,000 (at original document size of 8.5x11)

Notes
1. Coordinate System: NAD 1983 UTM Zone 13N
2. Base features produced under license from the Government of Saskatchewan.

Stantec

Algonquin Power Co.

Project Location
Near Morse, SK

113254056-016 REVB
Prepared by acory on 2017-01-31
Technical Review by ceidem on 2017-01-31

Client/Project
Algonquin Power Co.
Blue Hills Wind Energy Project

Figure No.
1-1

Title
Project Overview

1.1 PROJECT PROPONENT

Algonquin Power (the Proponent) owns a direct or indirect equity interest in more than 34 clean energy facilities including wind, solar, hydroelectric and thermal.

Algonquin Power financed, constructed and currently operates the Red Lily Wind-Energy Project (16 WTGs, 26.4 MW) near Moosomin, Saskatchewan and the Morse Wind-Energy Project (10 WTGs, 25 MW) near Morse, Saskatchewan. Other wind projects in Algonquin Power's portfolio include:

- St. Leon (63 WTGs, 99 MW) and St. Leon II (10 WTGs, 16.5 MW) Wind-Energy Projects in St. Leon, Manitoba.
- St. Damase Wind-Energy Project (10 WTGs, 24 MW) near St. Damase, Quebec.
- Odell Wind-Energy Project (110 WTG, 200 MW) in Cottonwood County, Jackson County, Martin County and Watonwan County, Minnesota.
- Shady Oaks Wind-Energy Project (71 WTGs, 109 MW) in northern Illinois.
- Senate Wind-Energy Project (75 WTGs, 150 MW) in Jack and Young Counties, Texas.
- Minonk Wind-Energy Project (100 WTGs, 200 MW) in Livingston and Woodford Counties, Illinois.
- Deerfield Wind-Energy Project (72 WTGs, 150 MW) in Huron County, Michigan.
- Wind-energy projects in Ontario and Quebec (currently in planning and regulatory phase).

The Proponent has leveraged their extensive project development experience in the wind industry, including direct experience in a prairie environment, to plan this Project. The Proponent has an established corporate environmental policy. This policy states that Algonquin Power is committed to carrying out all operations in an environmentally responsible manner and in compliance with all applicable laws, regulations, and industry standards. This same ethic is applied to the development of their Projects.

1.2 REGULATORY OVERVIEW

Algonquin's decision to opt-in to Saskatchewan's environmental assessment process means that the Project will be subject to an environmental assessment under Saskatchewan's *Environmental Assessment Act*. As part of the process, Algonquin has included a draft TOR that follows *Guidelines for the Preparation of the Terms of Reference* (SKMOE 2014a). This technical proposal and draft TOR will be reviewed by SKMOE's Environmental Assessment Branch, as well as multi-disciplinary experts from within the government. The interdepartmental review is coordinated by SKMOE. Comments will be addressed by Algonquin to the satisfaction of SKMOE at which time the final terms of reference are posted on SKMOE's website.

The next step is for Algonquin to complete the environmental assessment following the approved terms of reference. Ultimately, an Environmental Impact Statement (EIS) will be submitted to the SKMOE for review.

The Project is not anticipated to require federal assessment (i.e., subject to *Canadian Environmental Assessment Act, 2012*).

If approved, the Project can proceed to the permitting and construction phase of the Project. Table 1-1 summarizes applicable legislation that applies to the Project.

Table 1-1 Regulatory Requirements

Legislation	Description	Action Required
Federal		
Species at Risk Act (SARA), 2002	Protects endangered or threatened species and their habitats in Canada. *SARA* outlines the methods for steps that need to be taken to help protect existing habitat, and recover threatened habitats.	Mitigation or avoidance may be required if *SARA*-listed species are identified within the Project Area.
Migratory Birds Convention Act (MBCA) and Regulations, 1994	Applies to all lands where migratory birds breed and nest and prohibits the disruption or loss of active migratory bird nests.	Strategies such as timing of construction and pre-construction surveys will be utilized to avoid the disruption or loss of active migratory bird nests. Algonquin will consult with the Canadian Wildlife Service if construction is to occur on lands suitable for migratory bird nesting or breeding, and if the work will occur during the breeding and nesting seasons (approximately mid-April to end of August).
Fisheries Act, 1985, amended 2013	Applies to projects conducted in or near waterbodies and watercourses that are part of or that support commercial, recreational, and Indigenous fisheries. The Act requires that projects avoid causing serious harm to fish, unless authorized. The Act also provides standard measures and mitigation to avoid causing serious harm to fish.	Self-assessments will be completed and Requests for Project Review submitted to Fisheries and Oceans Canada (DFO) as required.
Provincial		
The Environmental Assessment Act, 1980	SKMOE reviews a TPP to determine if the Project is deemed a development under the Act.	Submission of TPP to SKMOE, although Algonquin has decided to opt-in to Saskatchewan's environmental assessment process.

Legislation	Description	Action Required
Environmental Management Protection Act, 2010	Provides for the protection of aquatic habitat from development or alterations to waterbodies or watercourses.	Aquatic Habitat Protection Permits will be required for wetlands that may be impacted by construction activities.
Heritage Property Act, 1980	Clearance will be obtained on any quarter sections with high heritage resource potential prior to construction.	A referral will be submitted to the Heritage Conservation Branch (HCB) for review. Heritage resource impact assessments (HRIA) will be conducted on all locations deemed to have high heritage value and submission of the HRIA results to the HCB will occur prior to construction.
Weed Control Act, 2010	The *Weed Control Act* designates weeds into three categories: Prohibited Noxious, and Nuisance. The objective of the Act is to promote early detection and eradication of these weeds.	Observations of weeds listed under the Act will be documented with Global Positioning System coordinates.
Wildlife Act, 1998	Plant and animal species at risk as defined in the *Wildlife Act*, are protected from being disturbed, collected, harvested, captured, killed, sold or exported without a permit.	Field permits will be obtained from SKMOE's Fish and Wildlife Branch prior to conducting field surveys for this Project. Mitigation or avoidance may be required if species at risk are identified within the Project Area.
The Wildlife Habitat Protection Act (WHPA), 1992	This Act allows the protection of wildlife habitat in Crown Land within the agricultural region.	Permitting or crossing agreements may be required for any potential alteration to protected lands.
The Pest Control Act	Provides for the control and destruction of certain pests.	Equipment will be cleaned before entering the work site and before leaving to the next site to prevent the spread of pests such as clubroot.
The Saskatchewan Farm Security Act	The Farm Land Security Board, under this Act, is responsible for administering Farm Foreclosure Protection, Home Quarter Protection and Farm Ownership Protection.	Farm ownership exemption will be obtained prior to development of the Project.
Municipal		
The Planning and Development Act, 2007	The Act allows the rural municipalities (RM) to address land use and development issues through the adoption of an official community plan and zoning bylaw.	Development permits will be required in RMs that have zoning bylaws.

Guideline documents, in addition to legislation, that are considered during the development of the Project include the Wildlife Siting Guidelines for Saskatchewan Wind Energy Projects

(SKMOE 2016) and the Saskatchewan Activity Restriction Guidelines for Sensitive Species (SKMOE 2015).

1.3 SCOPE OF ASSESSMENT

The scope of assessment focuses on those aspects of the Project that are most likely to interact with environmental components. The draft TOR outlines the approach to scoping the assessment for the Project (Appendix A).

1.4 PROJECT SCHEDULE

The Project phases reviewed as part of the future EIS consist of three phases: construction, operation and maintenance, and decommissioning. Currently, the Project is in the development phase which includes facility interconnection planning with SaskPower and undertaking aspects of Project permitting and approvals, environmental baseline studies, ongoing stakeholder consultation, zoning applications, detailed Project design, equipment procurement and finalizing Project financing.

Algonquin's schedule of activities for the proposed Project is presented in Table 1-2.

Table 1-2 Anticipated General Schedule of Project Phases

Project Phase	Project Schedule
Draft Technical Project Proposal and Draft Terms of Reference	January 2017-February 2017
Terms of Reference Finalization and Approval	February 2017-March 2017
Environmental Assessment (e.g., public consultation, field assessments)	January 2017-November 2017
Environmental Impact Statement Submission	January 2018
Permitting Phase	Early Spring 2018
Anticipated Construction	2019
Commercial Operation Date	2020

2.0 PROJECT DESCRIPTION

2.1 PROJECT NEED AND BENEFITS

The Saskatchewan government's energy plan seeks to have 300 MW of wind energy available to its integrated grid, in addition to the 198 MW of wind energy currently in place (CanWEA 2014). SaskPower is pursuing 'environmentally sustainable power generation' as part of its 'Green Power Portfolio' (which includes supporting the production of wind energy). Approval and development of this Project would assist the Saskatchewan government in fulfilling its commitments towards the promotion of clean, renewable energy production in Saskatchewan.

SaskPower has adopted a strategy to meet new load growth over the next several years using its Environmentally Preferred Power Strategy. This strategy is intended to encourage production of low-environmental-impact power, to utilize waste streams as a fuel source, to reduce SaskPower's carbon and other emissions, to monetize the value of low-environmental impact power and to add 'small-generation power' in step with SaskPower's local requirements. Under the Request for Proposal, SaskPower undertook a competitive process to procure up to 177 MW of wind power from one or more independent power producers. In early January 2017 SaskPower announced a change in location for the 177 MW Project, from the Chaplin location to an area which is located between Herbert and Neidpath in southwest Saskatchewan.

The Project will generate direct benefits, namely: job creation associated with the Project; and the Project expenditures, tax, lease payments and other impacts which capture the revenue flowing to the community and individual landowners.

The construction of the project will involve construction costs of several hundred million dollars. It will require 12 to 18 months to complete and will generate some approximately 33-70 person years of local employment directly and approximately 45-90 person years indirectly. In addition, the local expenditures on goods, services and accommodation will generate a significant impact on the local economy which could lead to tens of millions of dollars in indirect and induced economic benefits.

During operation, the Project is expected to employ 8-10 persons directly and will require local goods and services estimated in the millions of direct benefit to the local economy inclusive of wages and other payments. Included in the annual expenditures would be future property taxes, lease payments to landowners. In addition, the Project will provide another source of revenue to local farmers and landowners and draw attention to the unique community of the Rural Municipalities (RMs) of Morse and RM of Lawtonia as another aspect to the local tourist economy.

2.2 ENVIRONMENTAL MANAGEMENT FRAMEWORK

Algonquin is committed to incorporating environmental management approaches and strategies into Project planning and execution so that the Project is compliant with regulatory requirements and avoids or reduces potential negative effects to the environment. Algonquin will consult with provincial regulators and the public to better understand the issues that are of most concern to them, as well as to understand requirements for the preparation of the EIS.

Algonquin has experience developing, operating and maintaining wind energy projects in Saskatchewan. This experience will be used in Project planning and proactive management of the potential environmental effects. The incorporation of environmental management tools into Project planning and execution will occur in several ways, including in the design and location of Project components, avoidance or mitigation of potential effects on remaining natural features (include committing to conducting pre-construction surveys), and through development of an Environmental Protection Plan (EPP).

A Project-specific EPP will be developed prior to construction and based on the final approved permitting layout of the Project. The EPP will summarize Algonquin's corporate commitments and regulatory requirements for the Project's environmental management and is intended to gather all environmental commitments into one document that can be used by project managers, contractors and regulators to manage Algonquin's commitments over the life of the Project. Specifically, the EPP will detail and expand on the commitments made in the EIS and regulatory requirements identified through subsequent permitting. Items to be outlined will include specific mitigation and monitoring measures with reference to the regulatory and permitting requirements, post-construction reclamation plans, monitoring and follow-up, and an emergency response plan. Monitoring and follow-up programs will be Project phase-specific and designed based on the potential effects that may occur during each phase. As activities and potential effects mechanisms are similar during construction and decommissioning, these follow-up and monitoring programs will be similar.

For potential effects during the operation phase of the Project, the EPP will be based on an adaptive management approach. Adaptive management is a systematic process for continually improving management policies and practices by learning from the outcomes of previously employed policies and practices. A tiered approach to adaptive management can be an effective management tool in addressing any residual environmental effects by assessing effects, implementing a specific mitigation measure(s), reassessing effects and learning from previous measures, and adjusting mitigation measures if necessary.

2.3 PROJECT LOCATION AND PERMITTING LAYOUT

The Project will be located between the towns of Herbert and Neidpath, Saskatchewan, approximately 40 km east of Swift Current, SK (see Figure 1-1). The permitting layout for the Project is not yet finalized; however, it is expected that the Project will encompass approximately 42 to 110 quarter sections within the Project Area, which consists of 470 quarter sections. This

rough estimate is anticipated to change as the permitting layout is refined and finalized during the coming months. It should be noted that the Project will not disturb entire quarter sections; only small amounts of land within each quarter section will be used to accommodate Project infrastructure such as WTGs, access roads and collector lines.

2.4 PROJECT ALTERNATIVES

Algonquin is active in the development of renewable-power generation across North America and is exploring the potential for wind-energy projects at a number of locations in Saskatchewan and across Canada. There are several alternative methods of generating power (e.g. coal and natural gas, which are hydrocarbon-intensive in both their construction and their operation). However, both SaskPower and the Proponent have chosen to expand their portfolios of 'green' power generation by continuing to develop wind-energy facilities at locations that are suitable for the production of wind power, adjacent to underutilized transmission facilities and centres of low population density.

Algonquin selected the Project location, which they had already been investigating for any future opportunity, after the Chaplin Wind Energy Project location was not accepted by the SKMOE. The alternative Blue Hill Wind Project area is situated in a location to comply with SKMOE's *Wildlife Siting Guidelines for Saskatchewan Wind Energy Projects* (SKMOE 2016). The selection for the wind site requires the consideration of several factors. When looking for prospective sites, two important factors involve aligning the wind resource Capacity Factor with favourable transmission factors and load requirements. As different locations were explored, as a substitute for the Chaplin Wind Energy Project, the Proponent also weighed other factors into the decision making process. Alternative areas in the province were considered where wind-energy projects appear to have the potential attributes necessary to satisfy SaskPower's Environmentally Preferred Power Strategy requirements and where local communities have signed landowner option agreements for the placement of WTGs on private property.

2.5 PROJECT COMPONENTS

2.5.1 Wind Turbine Generators

The Project will consist of 42 to 88 WTGs, each with a capacity between 2.0 and 4.2 MW, for a total capacity of 177 MW. Final WTG selection will be influenced by several factors, including specific parameters of the local wind regime and economic (market and debt-financing) considerations at the time of procurement.

Each WTG consists of the following components: tower, nacelle, hub, rotor blades, controller and transformer (see Figure 2-1). The height of each WTG tower will be between 80 to 110 m from the ground to the hub depending on final equipment selection. Each WTG will consist of three blades (each approximately 56 to 70 m long) with a rotor diameter (creating a "rotor-swept area") of approximately 92 to 142 m. The overall height of each WTG, from ground to top of blade height, will be approximately 136 to 180 m (see Figure 2-2).

The nacelle at the top of each tower houses the generator, gearbox (if required, depending on the type of WTG selected), bearings, couplings, rotor and auxiliary equipment (see Figure 2-2). Depending on the WTG type and design, a transformer may also be contained within the nacelle or situated external to the WTG at the base of the tower. A water-cooled system, which includes a radiator, dissipates heat from the generator. The radiator will contain a water- and ethylene-glycol mixture that will be tested annually. The gearbox (if required) will contain approximately 300 litres of oil (perhaps more if larger WTGs are utilized) that will be filtered during regularly scheduled maintenance and reused. The oil will only be changed as needed, approximately once every four years. The gearbox (if required) is designed as a closed leak-proof system with gaskets to prevent fluid loss. The nacelle enclosure that houses all of the electro-mechanical components is constructed of reinforced fibreglass which is lined with sound-insulating foam, ventilated and interiorly illuminated with electric lights for safety to facilitate maintenance. The rotor blades are constructed of fibreglass and epoxy resin or carbon-fibre.

Figure 2-1 Wind Turbine Generator Components

The tower will be constructed of tubular steel or reinforce concrete, with a diameter of approximately 4 to 6 m at the base (see Figure 2-2). An internal ladder from ground to nacelle level is provided for maintenance access. Guy wires are not used for tower support. WTGs will be externally lighted in accordance with requirements of Transport Canada.

Each WTG will be seated on and torque-bolted to a reinforced concrete foundation. Dimensions, depth and type of foundation design will depend on local soil and surficial geological characteristics, wind forces on the selected WTG model, and other site-specific

conditions. For the purposes of this document, WTG foundations were assumed to be similar in size to those constructed for the Red Lily Wind-Energy Project (near Moosomin, Saskatchewan), approximately 2 m deep and 15 m in diameter (i.e., 175 m^2 total area). However, if WTGs chosen for this Project are larger than those utilized at the Red Lily project site, foundations could be deeper and larger.

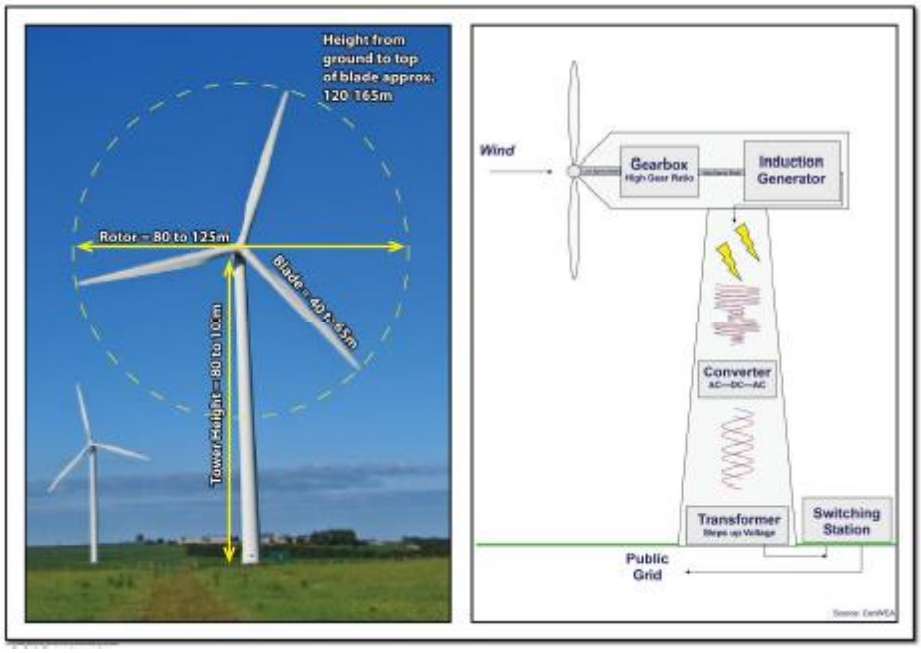


Figure 2-2 Wind Turbine Generator Structure and Foundation

2.5.2 Temporary Workspace around WTGs

Temporary workspace will be located around each WTG to accommodate laydown areas, crane operation and vehicle staging. The locations of these workspaces will be sited to avoid Crown land or other sensitive features (e.g., wetlands, native grassland). Temporary workspaces will only be needed during construction, during infrequent maintenance (e.g., turbine blades, WTG structure) or in the event malfunction. To be conservative, it has been assumed that the temporary workspace will be the area within a 100 m x100m from the center of the WTG. A large portion of the temporary work space will see limited impact with the majority of operations happening within 25 m of the WTG foundation.

2.5.3 Electrical Collection System

The voltage of electricity produced by the WTG will be stepped-up from 690 V to 34.5 kV by a transformer located inside the nacelle or outside the tower at the base of each WTG (see Figure 2-2). The power will then be distributed through underground collector lines (on private land) or along overhead collector lines (located along existing municipal grid road rights-of-way

[ROW] if allowed by municipal bylaws) to a new collector substation, to be built by the Proponent. Underground cables will be installed using a well-established trenchless method, referred to as pipe-and-cable-laying ploughing (or "mole-plough"). Cable lengths of below-ground and above-ground collector lines will be determined once WTG type and locations are determined.

At the collector substation, power collected from WTGs will be stepped up from 34.5 kV to 138 kV and transported by overhead 138 kV (or higher) transmission lines located along road ROWs to the SaskPower Switching Station, which has yet to be located. Approvals for system tie-in transmission lines and other transmission infrastructure will be completed by SaskPower under a separate approval process and are not considered as part of this Project.

A communication and data-collection fibre-optic cable will also be placed within the same ROW as the electrical collection system wherever possible. This will help to reduce the amount of land affected by the Project footprint. Warning signage will be placed, as necessary, above any underground feeder cables.

Easements, if needed for electrical collection system ROW development, are normally secured through negotiation of an agreement with property owners and will be developed by Algonquin.

2.5.4 Permanent Access Roads

The Project will require the construction of permanent access roads to be used during the construction, operation and maintenance phases. Road lengths will be determined once the WTG type and locations are established. During the construction phase, these roads will be approximately 10 m-30 m wide and capable of supporting heavy equipment including heavy lift cranes and transport vehicles. Once the construction phase is completed, roads will be reclaimed to a 5-6m width, gravel, "low-profile" cross-section, used to service and maintain WTGs during the operation and maintenance phase.

2.5.5 Permanent Maintenance/Storage Facilities

Materials and equipment used during the operation and maintenance phase will be stored within an operation and maintenance (O&M) building and associated storage facilities. This building may be an existing building near the Project site or a new structure constructed within the Project Area. This building and adjacent facilities (e.g., parking lot, storage yard) will require approximately 1-2 ha of land. The building footprint will be approximately 380 m^2 and is expected to include offices and a permanent holding tank/septic field for sanitary waste (if not connected to a local municipal sewer system). A gravel parking lot and adjacent storage yard, if not already in existence, will be constructed in the vicinity of the O&M building with sufficient parking available for Project staff and guests. A standard 2.4 m-high chain-link fence with locked gates may be constructed around the O&M storage yard as required. No fencing will be placed around the WTGs.

2.5.6 Temporary Offices and Laydown Area(s)

On-site temporary construction offices (i.e., ATCO trailers) will be placed on private land during construction and will likely occupy approximately 0.2 to 0.8 ha of annual cropland. The laydown area(s) will also be sited on private land and may be approximately 5-15 ha in size to temporarily accommodate storage of Project components.

2.5.7 Meteorological Tower

The Project currently maintains one temporary 60 m meteorological (MET) tower to continuously monitor wind speed, wind direction, air temperature, air humidity, and other parameters as needed to create the data needed to help optimize the Project's operations plan. The MET tower is anticipated to be removed once construction is complete and will be replaced by approximately two to three permanent hub-height MET towers to support ongoing operation.

2.6 PROJECT ACTIVITIES

The following sections describe the planned activities grouped in three phases associated with the Project.

2.6.1 Construction

During construction, installation of the various Project components will require the following sequence of activity categories:

- Site preparation, including clearing and grading of WTG locations, access roads, laydown areas, and temporary work spaces
- Installation of WTG foundations and turbine erection
- Installation of below and above ground collector lines and associated substation
- Reclamation and site landscaping

Details on construction activities are summarized in Sections 2.6.1.1 to 2.6.1.10.

2.6.1.1 Materials and Equipment

Project construction will have minor requirements for resources and/or materials, limited to:

- Concrete, including water, for the construction of the O&M building and wind-turbine foundations.
- Granular material for the construction of access roads, the O&M building parking lot, the laydown area(s) and construction camp, and crane pads.
- Fuel and oil for the operation of heavy machinery and hand tools.

Raw materials required for Project construction (e.g., gravel for roads, water for foundation construction and road dust control, concrete for foundations) will be sourced locally to the extent feasible and will be the responsibility of the contractor. Contractors working on behalf of Algonquin will be required to ensure that all resources used, and locations that resources may be extracted from, have been used or located in accordance with any applicable regulatory guidance (e.g., borrow-source locations will undergo appropriate heritage resource screening; water withdrawals will have been conducted in accordance with Water Security Agency permitting and approvals, if applicable, etc.).

Delivery of materials and components for Project construction will likely be by truck. However, some transportation of materials may occur by rail, pending consultation with the rail line. Major equipment utilized for the Project construction will include:

- Crane(s) for erection of WTGs
- Backhoe(s) for excavation of foundations
- Grader(s) for ground preparation of permanent access roads
- Dump trucks for removal of excavated road and foundation material as well as delivery of road material
- Compaction roller(s) for compaction of permanent access roads
- Cement trucks for delivery of cement for foundations
- Tractor-trailers for delivery of construction equipment, WTGs and other permanent equipment
- Construction trailers to house the temporary offices of the construction contractors and subcontractor

The quantities and specifications of major equipment will depend on the Project construction logistics and schedule.

2.6.1.2 Site Preparation

Site preparation includes clearing and grading of each WTG site and new access road locations. The construction area at each WTG site, which is expected to be approximately 10,000 m^2, will include the foundation area, a crane pad adjacent to each foundation (up to 600 m^2 WTG), and an area for blade assembly and storage of WTG components.

Two to three laydown areas (each a maximum of 5-15 ha) will be established on private annual cropland in proximity to construction activities. Following the completion of each WTG, assembly/component storage areas and temporary lay-down areas will be rehabilitated back to the original condition of the land.

2.6.1.3 Access Road Development

WTG components will be transported by flatbed truck or by rail. Access to construction sites by transportation providers from various suppliers will avoid, to the extent feasible, any potential for damage to properties, lands, local bridges, or any sensitive environmental feature at or near the construction site. Following construction, municipal grid roads will be restored to their pre-construction condition, should the need arise.

Permanent access must be developed from the existing road network to each WTG location. Permanent access roads to each WTG will be designed to be as short as possible and to intersect with existing municipal grid roads. During the construction phase, permanent access roads will be approximately 10-30 m wide to accommodate the wide turning radius of large trucks, heavy equipment, transport vehicles, and construction equipment (e.g., cranes to erect WTGs). After construction, roads will be reduced to approximately 6 m in width. Total length of permanent access roads will be determined after WTG selection and location.

To reduce or avoid Project-related effects, access to construction sites will utilize existing municipal grid roads along section and quarter section lines to the maximum extent practical (see Figure 1-1). Permanent access roads will be constructed along section and quarter section lines, where appropriate, and will be as short as possible to reduce or avoid adverse effects to the land. As some of the Project will be developed on land that has little municipal grid-road access, these permanent access roads will be built using the network of pre-existing limited-use roads and farmer trails, to the maximum extent feasible. Movement of cranes from one WTG site to another will use access roads established for the Project.

The Project layout will be developed to avoid waterways that require stream crossings for new permanent road construction. There is the potential need to upgrade existing municipal grid-road stream crossings (e.g., newer or larger culverts) to accommodate movements of heavy construction equipment (e.g., wide loads, cranes. etc.). If stream crossings are needed, appropriate regulatory guidance and approvals will be obtained (e.g., construction timing, erosion-control procedures, etc.) and the location and specifics regarding stream/drainage crossing sites and stream-crossing techniques and mitigation methods will be incorporated into the Project's EPP.

Where excavation is required to construct permanent access roads, stockpiled topsoil will be separated and stored away from the subsoil. Subsoil and stored topsoil will then be used to restore land adjacent to the temporary 10-30 m-wide roads needed during construction to the permanent 5 m-wide roads.

A construction manager will supervise access to WTG sites during construction. It is anticipated that only those employees (and individuals approved by the construction manager) will be allowed access for safety and equipment-security reasons. Additional details of access management measures will be outlined in the EPP and will be revised, as required, by the

Proponent and the contractor in consultation with RM council(s) and local stakeholders, including landowners.

2.6.1.4 Foundation Installation

The foundation for each WTG will be excavated using a large back hoe. Depending on the geotechnical conditions, the foundations are expected to be generally 2-3 m in depth or more depending on the size of the WTG selected for the Project and geotechnical conditions which require foundation piles. Trucks will deliver concrete to be poured at the foundation site. It is anticipated that approximately 30 truck trips will be needed to pour concrete for each foundation site. Foundations will need to cure for approximately two weeks.

During WTG-foundation construction, some portion of the excavated subsoil will be incorporated around the foundations as backfill. Excess excavated subsoil may be used either for final grading around the WTG towers or removed from the site. Excess topsoil may be feathered into the adjacent agricultural fields. Construction of WTG foundations will utilize temporary erosion-control measures to reduce siltation in any erosion-prone areas as outlined in the EPP.

2.6.1.5 Turbine Assembly

A crane will be used to erect and assemble the various components making up a single wind turbine. In some cases, matting and leveling around the WTG location may be required to stabilize the crane. The erection and assembly process typically takes 2 to 4 days (dependent on weather conditions) for a single WTG.

2.6.1.6 Electrical Collector Line System Installation

Underground collector lines will be installed using low-impact techniques (e.g., mole-plough) to help reduce effects on native prairie. Where collector lines follow municipal road allowances, above-ground collector lines will be placed on poles.

The crossing of streams or drainage channels may be required for Project construction activities such as underground cable installation. The number, location and types of stream/drainage crossings required, if any, will be reduced where possible. Locations where electrical collector and fibre-optic communications cables must cross municipal grid roads will also be reduced to the maximum extent possible. Directional drilling of electrical collector and fibre-optic communication cables under roadways will occur when provincial roads must be crossed or if municipal approval to disturb a road is not granted. Mole-plough methods and other low-impact techniques within pre-existing municipal grid road ROW will be used wherever feasible.

2.6.1.7 Fuel Storage

Up to 1,000 litres of diesel fuel may be stored at the marshalling yard areas during the construction phase. A mobile service truck will be used to refuel most of the larger construction equipment (i.e., cranes, front-end loaders, backhoes, etc.).

The contractor will be required to site all fuel-storage and equipment-servicing areas a minimum distance of 100 m away from any waterbody. At all times, the contractor will be required to have materials available at the construction sites to contain and recover fuel spills in accordance with provincial regulations (i.e., *The Environmental Management and Protection Act* [Government of Saskatchewan 2015]).

2.6.1.8 Transportation of Components

During construction, the estimated peak daily traffic volume to each WTG site is estimated to be approximately 30 to 40 trucks on average (depending on construction schedule). These trucks will be needed during temporary access road construction, foundation construction and erection of WTGs. However, the majority of traffic will be associated with concrete pouring for foundations and will happen over a short period of time (i.e., a few days for each WTG foundation). Caution signage will be posted and if required flag-persons, as required, in the vicinity of construction activities to advise local traffic of the need for reduced speed limits.

2.6.1.9 Waste Management

Industry best practices will be used to properly reduce and manage waste during Project construction and the contractor will comply with applicable legislation in the handling, storage, transport and disposal of wastes. Waste materials generated during construction is expected to include domestic waste and industrial waste (both inert and hazardous materials). Construction sites will be cleaned on a daily basis, with all waste materials placed in designated containers and transported to an appropriate off-site landfill, controlled materials, or recycle depot. Sanitary sewage generated from on-site mobile sanitary facilities will be collected by permitted sewage haulers and then hauled by truck to a suitable and approved sewage disposal site for treatment and disposal.

Hazardous wastes and dangerous goods will be handled, transported and disposed of in accordance with applicable legislation including the Hazardous Substances and Waste Dangerous Goods Regulations under *The Environment Management and Protection Act, 2010* (Government of Saskatchewan 2010a), and in accordance with the procedures and mitigation measures described in the EPP.

2.6.1.10 Post-Construction Reclamation

Upon completion of the construction work, topsoil will be replaced on disturbed areas, which will be revegetated with crops, pastures grasses or native prairie species, depending on the original vegetation present, as determined in consultation with landowners, where appropriate. Any

land disturbed during foundation construction, and not required for Project operation, will be rehabilitated to the maximum extent needed and feasible by decompaction and the redistribution of reserved topsoil. Where necessary, revegetation and reseeding will be completed as per landowner specifications. In areas of native prairie approaches to reclamation will include natural recovery where native prairie has experienced limited effects, or seeding with native species where areas have been more disturbed or where natural recovery has not been successful. Follow-up monitoring will identify these areas. Native prairie re-seeding will use locally sourced native prairie seed stocks (Government of Saskatchewan 2012). Specific methods for revegetation will be identified in the EPP. Seed mixes will be determined in consultation with land owners/leasees.

2.6.2 Operation and Maintenance

2.6.2.1 Operation

The wind-energy facility can operate 24 hours per day, 365 days per year. However, WTGs will automatically shut down during unfavourable wind conditions or (infrequently) when an operational problem (e.g., mechanical, electrical, environmental) is detected. Selected WTGs may also be shut down periodically for regularly-scheduled maintenance or in special circumstances (e.g., accommodating seasonal aerial crop spraying). The computerized control system of the WTGs automatically directs the nacelle and rotor to face into the wind and adjusts blade pitch to maximize wind-capture potential and power output.

The rotation speed of the WTGs will vary from approximately 10 to 20 revolutions per minute, depending on the make and model of WTGs selected for the Project. The computerized system will automatically shut down a WTG when mechanical problems are detected (e.g., low hydraulic pressure, high generator temperature) and in instances when ice buildup occurs on WTG blades. When an operational shutdown occurs, information is automatically reported via high-speed fibre-optic communication lines to the main computerized system (Supervisory Control and Data Acquisition [SCADA]) located in the O&M building. The SCADA system monitors and controls the operation of each WTG and the Project as a whole (i.e., all WTGs collectively). WTGs become operational at minimum wind speeds of approximately 10 km/hr and automatically shut down when wind speeds reach approximately 90 km/hr to protect rotor and drive-train machinery from damage. It should be noted that these operational estimates are specific to each turbine manufacturer's model; WTG operational specifications may vary, dependent on manufacturer and model.

The Power Purchase Agreement between the Proponent and SaskPower has a minimum term of 25 years, with provisions for extension negotiations between the parties. The Project has an economic/design life of approximately 25 years. At the end of its economic life or at some interval before (e.g., at less than 25 years), the WTGs and ancillary facilities will likely be upgraded ("repowered") to extend the energy-production lifespan of the Project, using newer technology.

During Project operation, WTGs will be operated in accordance with good wind-energy practices and will comply with manufacturer's recommendations to maintain equipment warranties and achieve the expected operational life. WTGs will also be maintained in accordance with manufacturer's recommendations and serviced by trained wind-energy technicians.

2.6.2.2 Routine Maintenance

Routine maintenance activities are typically scheduled at six-month intervals (depending on manufacturer's requirements), and will be specified by the WTG provider, with specific tasks scheduled for each interval. Each WTG will be removed from service (i.e., shut down), in rotation so as not to disrupt service, for approximately one day, allowing two to three technicians to perform maintenance activities.

Standard maintenance equipment will be stored on-site at the O&M building and will include hydraulic hoses, electrical components, fittings, test equipment, gauges and lubricants. Additionally, large spare components such as blades, generators and gearboxes may be stored within the maintenance yard. During operations, maintenance service vehicles (e.g., trucks, forklifts) will also be located at the O&M building. Specialized equipment not required for routine operations or maintenance (e.g., cranes, snow-removal equipment) will be sub-contracted as needed.

Each WTG contains equipment components that require lubricants, oils, or coolants (e.g., ethylene glycol). These potentially hazardous liquids will periodically need to be checked or refilled. Some quantities of these chemicals will need to be stored on-site in the maintenance yard of the O&M building.

To reduce or avoid the potential for harmful effects to people or to the environment, chemicals stored at the O&M building will be held in on-site tanks or drums equipped with secondary containment basins or vessels to contain drips or small spills and thereby prevent runoff of contaminants from the storage area in accordance with appropriate regulations. Hazardous materials anticipated to be used, stored, transported, or disposed of because of the Project include oils, lubricants, and paints, which are not unlike materials used in local agricultural industries.

Materials such as various greases, oils and oil filters are used during WTG maintenance activities. Following all WTG maintenance work, the work area will be cleaned and all surplus lubricant- and grease-soaked rags will be removed and disposed of in an approved manner at a designated disposal facility. The cleanup protocol will be outlined in the EPP to ensure a safe operating environment and reduce or avoid the risk of fire. All transportation, handling and disposal of dangerous goods or hazardous wastes will be in accordance with the appropriate regulations.

Additional information regarding hazardous materials and fuel handling, use and storage will be described in the EPP.

2.6.2.3 Unplanned Maintenance

Modern WTGs are reliable and designed to operate for a minimum of 25 years. However, in the rare event of component failure, the WTG will be out of service until the faulty component is replaced. Most unplanned maintenance events involve small component failure (e.g., switches, fans, sensors), and can usually be repaired within a few hours by a single technician.

The Standard Operating Procedures (SOPs) and maintenance protocols developed by WTG manufactures are specific to the make and model of each WTG. These SOPs generally relate to safety, potential emergency situations, training, and potential contingencies such as fire and equipment malfunctions. Topics covered by SOPs include:

- Health and safety
- WTG safety
- Operation and user guide
- Service instructions for safety test and start-up test
- Functional description control system
- Functional description WTG data and grid monitoring
- Service instructions

The operational SOPs for the Project may need to be modified to address site-specific issues and will be finalized prior to the commissioning and operation of the facility.

2.6.3 Decommissioning

The expected lifespan of WTGs is approximately 25 years. At the end of the life of the WTGs, they may be replaced or reconditioned, depending on future technology and the demand for wind power, or the equipment may be decommissioned. In the event that the Project would be fully decommissioned, appropriate decommissioning plans, environmental protection plans and emergency response plans would be generated in consultation with appropriate regulatory authorities.

2.6.3.1 Conceptual Decommissioning Plan

The conceptual decommissioning plan (DP) for the Project would be designed to return the Project site to pre-development conditions. All Project components would be dismantled and removed from the site and WTG pads would be removed to a depth of 1 to 1.5 m. The objective of Project decommissioning would be to restore lands disturbed by the Project to a condition

consistent with previous land uses (e.g., crop production, grazing, municipal grid road allowances and ditches).

Activities that would occur during decommissioning would involve temporary workspaces and the use of equipment similar to that used for Project construction (as described in Section 2.6.1). Construction mitigation measures and industry best management practices as outlined (and updated as appropriate) in the EPP to be generated prior to construction of the Project, would be utilized to the extent feasible.

The conceptual DP would be designed to be a dynamic approach to facilities management in that it would be continually reviewed and updated over the life of the Project to reflect changes and developments in technologies, Project design and regulatory requirements.

2.6.3.1.1 General Environmental Protection

During decommissioning and subsequent restoration activities, general environmental protection and mitigation measures would be implemented. Many activities during decommissioning would be comparable to the construction phase including the use of heavy equipment on site, restoring constructible areas around all Project infrastructure, and preparing staging areas. General mitigation measures and best management practices, as appropriate, erosion and sediment control, air quality and noise mitigation, and contingency plans for unexpected finds and spills, would be outlined and provided in the EPP prior to decommissioning.

2.6.3.1.2 Pre-dismantling Activities

Prior to engaging in decommissioning works, the Proponent would develop a DP in accordance with SKMOE requirements at the time of decommissioning. Decommissioning and restoration activities would be performed in accordance with all relevant statutes and regulations in place at the time of decommissioning.

At the end of the Project's useful life, it would first be de-energized and isolated from all external electrical lines. Prior to any dismantling or removal of equipment, staging areas would be delineated at each WTG site, along access roads, the MET tower location(s), along collector lines, along transmission lines, the substation property, O&M building, storage shed, and cable landing locations, as appropriate. All decommissioning activities would be conducted within designated areas; this includes ensuring that vehicles and personnel stay within the demarcated areas. Work to decommission the collector lines and transmission lines would be conducted within the boundaries of the municipal grid road allowance and appropriate private lands.

Crane pads or mats, to accommodate dismantling, would be installed at each WTG location. These measures would be implemented with consideration of industry best management practices, and will be determined by an environmental advisor prior to decommissioning.

2.6.3.1.3 Equipment Dismantling and Removal

Staging Areas

Temporary staging areas at each WTG site, along access roads, the MET tower locations, along collector lines, along transmission lines, the substation property, and O&M building, could be used for temporary storage of Project components, excavated foundations and for parking. These areas would not be excavated or graveled and would be restored to pre-existing conditions at the end of the decommissioning phase.

Wind Turbine Generators

The WTGs would be disassembled into their original component parts. A heavy-lift crawler and mobile cranes would be used to carry out the reverse sequence of steps that occurred during WTG assembly, namely:

- Removal of the blades and hub
- Removal of the nacelle
- Decoupling and lowering the tower sections

The WTG components would be temporarily stored at the staging area at each WTG site until removed from the site by truck. Vehicle movement would follow the same routes used during the construction phase.

WTG Transformers

The small transformer associated with each WTG would be removed for resale, reuse, reconditioning, or disposal. If the transformer is not located in the nacelle it would be located on a concrete pad adjacent to the base of the WTG. In this situation the foundation of each transformer would be removed as per the Proponent's lease agreement with the landowner.

WTG Foundations

The WTG foundations would be partially removed to a depth of approximately 1 to 1.5 m below grade, in accordance with the land agreements. This depth would enable normal agricultural practices to be conducted over the foundation areas. Concrete would be removed from the site by dump truck and disposed of in accordance with appropriate regulatory guidance and regulations.

Crane Pads

After WTG removal is completed, temporary crane pads would be removed; this includes the geotextile material beneath the pads and granular material. Granular and geotextile materials would be removed from the site by dump truck and disposed of in accordance with appropriate regulatory guidance and regulations.

Electrical Collector Lines

Underground collector lines on private property would be cut with the ends buried to a depth of approximately 1 m and left in place, in consultation with the landowner and in accordance with the land agreements. Any junction boxes would be removed. Underground collector lines, splice vaults and junction boxes installed in municipal grid-road allowances would be removed, if required by an agreement with the RM.

Any aboveground collector lines on poles along public road allowances would be removed, if necessary, in consultation with the RM. In areas where aboveground collector lines are strung on shared-use poles, only the lines would be removed, unless otherwise required by the shared-use agreement that would be developed with other users.

Pad-mount Transformers (if required)

Pad-mount transformers, located immediately adjacent to each WTG, and grounding grids would be removed, and the associated concrete foundation would be removed to approximately 1 m below grade, in accordance with the land agreements. All electrical system components would be taken off-site by truck and disposed of in accordance with appropriate regulatory guidance and regulations.

Electrical Substation

The electrical substation would be dismantled as agreed to, or as necessary, in accordance with the land-lease agreement. The station components would be removed, and the concrete foundation would be removed to approximately 1 m below grade. All granular and geotextile materials would be removed from the site by dump truck. All electrical system components would be taken off-site by truck and disposed of in accordance with appropriate regulatory guidance and regulations.

Permanent Access Roads

All access roads would be removed, including culverts, the geotextile material beneath the roads and granular material. The access roads would be returned to a similar condition as prior to Project commencement. Excavated areas on agricultural land would be brought to grade with fill and topsoil to be taken from surrounding land. All materials would be removed from the site by dump truck and disposed of in accordance with appropriate regulatory guidance and regulations. Where the landowner sees it advantageous to retain access roads, these would be left in place as long as compliance with municipal regulations was recognized. Culverts would be removed if requested by the landowner and approved by the RM, SKMOE and/or DFO, as appropriate.

Operations and Maintenance Facility

If a new O&M building is constructed, it is possible that the O&M building could remain in place, depending on the agreement with the landowner. If not, the O&M building would be dismantled as agreed to, or as necessary, in accordance with the land-lease agreement. The

fencing would be removed, and the concrete foundation would be removed to approximately 1 m below grade. All granular and geotextile materials would be removed from the site by dump truck. All electrical system components would be taken off-site by truck.

Meteorological Towers

The MET towers would be disassembled and removed by truck from the site and disposed of in accordance with appropriate regulatory guidance and regulations. Foundations would be partially removed to a depth of approximately 1 m below grade. The sites would be accessed using the same route as during the construction phase.

2.6.3.2 Reclamation

This section describes how the lands used for the facility components will be reclaimed to bring the site into a condition that is consistent with pre-development conditions. If agreed to with the landowner, it is possible that the site could be restored to a different land use, if desired.

Site-Reclamation Plan

At the time of decommissioning, a Site Reclamation Plan should be created based on the industry standards and best management practices at the time of decommissioning, and in consultation with landowners and the appropriate regulatory and government bodies.

Heritage Resources

Heritage resources which have the potential to be impacted by the removal of facility components would be reviewed with the Heritage Conservation Branch (HCB) of the Saskatchewan Ministry of Parks, Culture and Sport prior to removal. Mitigation and monitoring measures may also be required including plans for replanting and restoration and would also be reviewed and implemented in consultation with the HCB.

Agricultural Lands

Areas that would require excavations during decommissioning of the facility will have subsoil or clean fill added as necessary. Areas that may have compacted due to decommissioning activities would be restored using deep ploughing equipment. Topsoil would be added to similar depth as surrounding areas, where necessary. Imported topsoil would be of the same or similar soil type and texture as pre-construction conditions and/or adjacent lands and would be selected with input from the landowner. In areas that supported native prairie species, a native prairie seed source appropriate for the area will be utilized for reseeding. Areas would be graded to pre-construction conditions and restored appropriately, in consultation with the landowner.

Municipal Grid Road Allowances

Where Project infrastructure has been removed from roadside ditches, these areas would be seeded with quick growing native species to prevent topsoil erosion. The seed mixture would be determined at that time in consultation with the RM, the Saskatchewan Native Plant Society, native prairie restoration specialists and/or Saskatchewan Ministry of Agriculture. Erosion and sediment control measures would be left in place until seed is fully established, as determined by an environmental monitor.

If any underground collector lines require removal by request of the RM, the area would be rehabilitated to pre-existing conditions, as appropriate, in consultation with the RM and/or landowners.

Watercourse Crossings

Any proposed decommissioning works within or near watercourses would be discussed with the RM, SKMOE and/or DFO, as necessary, to determine any applicable guidelines, permitting, site-specific mitigation and/or remediation plans. It is envisioned that similar mitigation and monitoring measures implemented during construction would be used for the decommissioning of the Project. Measures are anticipated to include standard best management practices including erosion and sediment control during removal of the structures.

2.6.3.3 Institutional Control

In Saskatchewan, the concept of institutional control applies primarily to mine and mill sites. The Institutional Control Program (2005) applies to developments on provincial Crown lands. It is anticipated that for this Project, once decommissioning and reclamation activities are completed, no infrastructure will remain that would require institutional control. The areas previously occupied by Project infrastructure will have been restored to their pre-development condition. If a permanent structure (e.g., the O&M building) is left intact, that structure will be the responsibility of the landowner who takes possession of the facility.

2.7 WORKFORCE

2.7.1 Construction

Approximately 45 to 90 workers are expected to be required during the construction of the Project over the expected minimum 12- to 18-month construction period. Each component of Project construction will require workers with different types and levels of skills and training depending on the task (e.g., road construction, foundation construction, erection of the WTGs) (see Table 2-1). The Project contractor will likely be selected through a bidding process once approvals and permits are obtained to allow the Project to proceed to the construction phase. While the number of local jobs created for Project construction cannot be accurately determined at this time, it is estimated that about 90,000 to 180,000 person-hours of work will be generated during construction. Employment for those in nearby communities, if qualified and competent, will be preferred..

Trades required during the construction phase may include other trades not listed Table 2-1, such as:

- Road construction and foundation excavation workers
- Pipefitters
- Drillers/trenchers
- Masonry workers
- Windsmiths

Table 2-1 Estimated Workforce During Construction

Job Title	Job Description	Approximate Number of Positions	Approximate Length of Employment (months)
Phase 1: Foundation Construction			
Carpenters	Form foundations for WTGs and substation equipment and build scaffolding as required.	6-18	6-8
General Labourers	Perform general labour, assist skilled tradesmen, cleanup, locate equipment and material.	30-60	12-18
Rebar Formers	Tradesmen that physically place and join the rebar steel in the engineered pattern of the WTGs' foundations with wire.	12-24	6-8
Electricians	Install underground and overhead electrical transmission collection systems and terminate at the padmount (or in the nacelle) transformers and substation. Install electrical equipment, run electrical cables and terminate at end devices and Motor Control Centre.	4-8	8-12
Phase 2: Installation and Erection			
Offloading Riggers	Responsible for safe attachment of loads during any lifting activities.	12-18	6-8
Iron Workers	Responsible for the physical installation of tower sections, nacelle and blades. Using specialized tools, will torque all components together. Install substation structural steel.	12-18	6-8

Job Title	Job Description	Approximate Number of Positions	Approximate Length of Employment (months)
Crane Operator	Operate lift crane and tailing crane and pickers used for moving equipment and materials.	6-12	6-12
Assistant Gear Operator (forklifts)	Operators of smaller mobilized equipment such as bobcats and forklifts used to move equipment around the construction site.	6-12	6-12
Cleanup Labourers	Labour used to clean up the site, receive materials and ship fixtures back to vendors.	6-18	6-8
Electricians	Install underground and overhead electrical transmission collection systems and terminate at the padmount (or in the nacelle) transformers and substation. Install electrical equipment, run electrical cables and terminate at end devices and Motor Control Centre.	6-12	6-12
Site Management			
Project Manager/ Superintendent	Overall responsibility for the entire Project. Must ensure that safety, cost, schedule and quality standards are met. Project Manager will also ensure appropriate contracts are in place.	1-2	12-18
Project Coordinator (on-site part time)	Responsible for assisting the Site Management Crew as needed.	1	12-18
Safety Coordinator	Responsible for ensuring all construction and site activities are conducted safely and properly.	1	12-18
Timekeeper/ Administrative	Ensure all timesheets are properly coded, filed and processed.	1	12-18
Field Engineer	Ensure technical integrity and that the finished product meets drawings and specifications.	1	12-18
NOTE: The information provided is an estimate and will vary, to some degree, with the needs/discretion of the contractor.			

2.7.2 Operation

Approximately 8-10 workers will be required in full-time, skilled positions for the operation and maintenance phase of the Project. The type of positions required for the on-site operation and maintenance of the facility include:

- WTG operation and maintenance engineers and technicians (i.e., 'windsmiths')
- Wind-energy facility manager/supervisor
- Administrative staff

The Proponent is committed to providing local communities with the job-opportunity information needed to encourage interest and to promote participation in the development and ongoing operation of the Project.

2.8 ANCILLARY PROJECTS

2.8.1 SaskPower Connection

The proposed Project will interconnect with a SaskPower switching station which has yet to be located and built. SaskPower will be responsible for designing, permitting, and constructing the Project transmission line from the Project substation to the SaskPower switching station.

3.0 ENGAGEMENT

Algonquin will implement an engagement plan to actively solicit public input within the Project Area and from other individuals or groups that may have an interest in the Project including, but not limited to, landowners, municipal governments, First Nations and Metis communities, and special interest groups. Algonquin will also engage regulatory agencies to solicit their feedback about the Project throughout the regulatory process. Details of Algonquin's engagement plan are outlined in the TOR (Appendix A).

4.0 ASSESSMENT METHODS

Based on Algonquin's decision to 'opt-in' to the environmental assessment process, this technical proposal does not provide the full framework for assessing Project-specific environmental effects in accordance with SKMOE's *Technical Proposal Guidelines* (SKMOE 2014b). Instead, this document gives an overview of the environmental components found in the Project Area. A high-level discussion of potential effect pathways and mitigation measures is provided for each component. Details on the approach used for the assessment of Project-specific and cumulative effects are provided in the TOR (Appendix A).

4.1 SPATIAL BOUNDARIES

For the purposes of this document, one spatial boundary is used to describe the environmental setting in which the Project is located to provide SKMOE with information to better understand the potential issues related to this Project. This Project Area encompasses all lands located within the boundary of the Project (see Figure 1-1). It is understood that not all 470 quarter sections within the Project Area will be included the Project footprint once the permitting layout has been finalized. Spatial boundaries for the assessment of Project-specific effects are outlined in the TOR (Appendix A).

5.0 EXISTING CONDITIONS

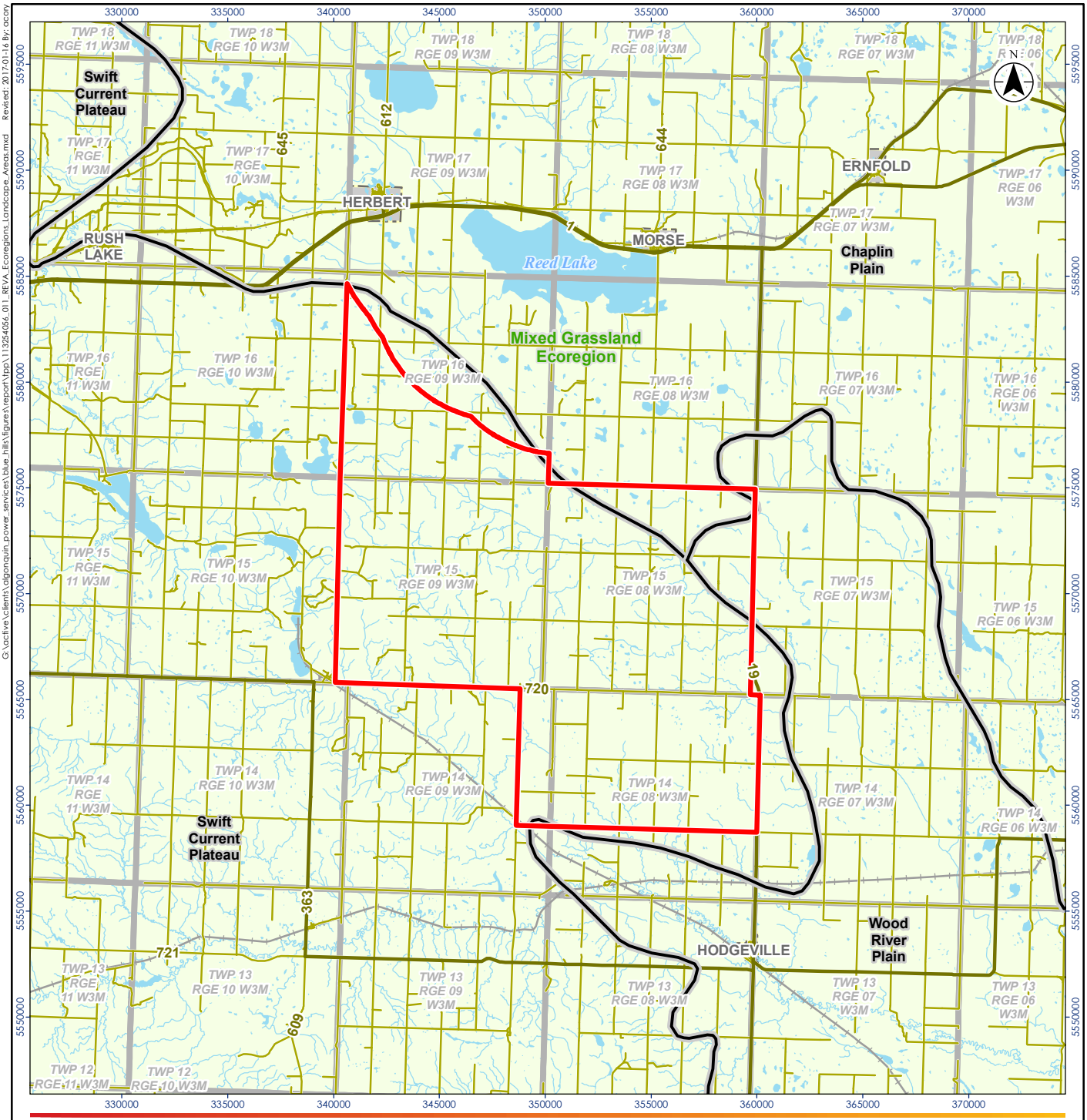
5.1 REGIONAL ENVIRONMENTAL SETTING

The Project Area is situated in the Mixed Grassland Ecoregion with portions overlapping the Swift Current Plateau and the Chaplin Plain landscape areas (Acton et al. 1998).

The Mixed Grassland ecoregion is a semiarid ecoregion found in southwestern Saskatchewan and southeastern Alberta and forms part of the Great Plains of North America. The region is composed of upper Cretaceous sediments and is covered almost entirely by kettled, loamy glacial till, undulating to dissected, loamy lacustrine sediments, and hummocky sandy eolian deposits. Soils are mainly Brown Chernozemic and Solonetzic. It is generally characterized by natural vegetation communities containing spear grass, blue grama, wheat grass, with associated species of June grass and dryland sedges, among others. Scrubby tree species typically occur to a limited extent on shaded slopes of valleys and river terraces. Approximately half the ecoregion is cultivated with annual crops; the remaining land is used for pasture and rangeland with remnant patches of natural vegetation communities undisturbed by agriculture and livestock production. This ecoregion has not been modified to the same extent that the Aspen Parkland or Moist Mixed Grassland have (Acton et al. 1998).

The Project Area, which is mainly cultivated land, also lies within the Missouri Coteau of the Prairie Pothole Region, which is characterized by numerous depressional wetlands that contribute substantially to the regional biodiversity. The Canadian portion of the Prairie Pothole Region is identified as Bird Conservation Region 11, which contains 341 species of birds within its 467,000 km^2 area (Environment Canada 2013). There are also an estimated 51 species of mammals and 15 reptiles and amphibians in the southern grasslands of Saskatchewan (Acton et al. 1998).

There are no large waterbodies within the Project Area, though at a regional level it is located 5.0 km southwest of Reed Lake and 4.5 km east of the Highfield Reservoir.



Landscape Area
Mixed Grassland Ecoregion
Project Area
Major Road
Minor Road
Railway
Watercourse
Waterbody
Town/City
Township

0 2 4 Kilometers

1:275,000 (at original document size of 8.5x11)

Notes
1. Coordinate System: NAD 1983 UTM Zone 13N
2. Base features produced under license from the Government of Saskatchewan.

Stantec

Algonquin Power Co.

Project Location
Near Morse, SK

113254056-011 REVA
Prepared by acory on 2017-01-16
Technical Review by jmdevink on 2017-01-16

Client/Project
Algonquin Power Co.
Blue Hills Wind Energy Project

Figure No.
5-1

Title
Ecoregions and Landscape Areas within the Project Area

5.2 TERRAIN AND SOILS

The Project has the potential to affect terrain and soils in the PDA. This section provides an overview of the existing conditions in the PDA to identify potential terrain and soil constraints to the Project. Soils are considered from an agricultural capability perspective.

5.2.1 Methods

Existing data were used to conduct a desktop analysis of baseline terrain and soil conditions within the Project Area. Baseline terrain and soil conditions were obtained from the Saskatchewan Soil Information Database Version 4 (SKSID 4.0) (Saskatchewan Land Resource Unit 2009). The databases provide a regional overview of terrain and soil resources for most of Saskatchewan.

For the terrain analysis, slopes were classed based on the Canadian Digital Elevation Data with the slope classes based on the SKSID 4.0 user manual (Agriculture and Agri-Food Canada [AAFC] 2009).

The desktop soils analysis focused on a general classification and identification of soil limitations for agricultural uses in the Project Area. Soil agricultural capability ratings were based on published values associated with SKSID 4.0 (Saskatchewan Land Resource Unit 2009). The SKSID 4.0 soil agricultural capability class ratings follow the Canada Land Inventory (CLI) rating system (CLI 1972) of soil capability classification for agriculture. The CLI system rates climate, terrain and soil factors independently, as each factor can control the suitability of a tract of land for crop production.

5.2.2 Existing Conditions

5.2.2.1 Terrain

The majority of the Project Area is in moderate (43.6%) or gentle (32.6%) slope classes that would not limit the ability of Project construction. Only a small portion (7.1%) of the Project Area were classed as steep slopes with none of the area in very steep slopes (Table 5-1).

Table 5-1 Slope Classes within the Project Area

Slope	Proportion of Project Area (%)
Nearly level to level (0-0.5%)	0.6%
Very gentle slopes (0.5-2.0%)	3.1%
Gentle slopes (2.0-5.0%)	32.6%
Moderate slopes (5.0-10%)	43.6%
Strong slopes (10-15%)	13.0%
Steep slopes (15-30%)	7.1%
Very steep slope (30-45%)	0.0%

5.2.2.2 Soils

Soils in the Project Area are primarily of the Chernozemic soil order. The soil agricultural capability ratings for soils in the Project Area range from Class 3 to 7 with Class 4 having the highest amount at 79.5% (Table 5-2). Moisture limitations (subclass M) is the most frequent primary limitation to agriculture within the area (Table 5-3). Lesser, but notable, portions of the land areas are limited by topography (20.1%) and stoniness (12.6%) (Table 5-3).

Table 5-2 Soil Agricultural Capability Ratings within the Project Area

Dominant Agricultural Capability Class[1]	Proportion of Project Area (%)
1 (no significant limitations)	0.0%
2 (moderate limitations)	0.0%
3 (moderately severe limitations)	1.0%
4 (severe limitations)	79.5%
5 (very severe limitations)	15.1%
6 (perennial forage crops)	4.2%
7 (no capability for arable culture or permanent pasture)	0.3%
Note: [1] Environment Canada (1972).	

Table 5-3 Primary Limitations to Agriculture within the Project Area

Primary Limitation to Agriculture[1]	Proportion of Project Area (%)[2]
M – Moisture limitation	72.3%
N – Salinity	2.0%
P – Stoniness	12.6%
S – Adverse soil characteristics	0.6%
T - Topography	20.1%
W – Excess water	1.8%

Note:
[1] Environment Canada (1972).
[2] The sum of limitations to agriculture exceeds 100% as soil areas may have more than one limitation.

5.3 AQUATICS

Fish and fish habitat are protected under both provincial (*The Wildlife Act*) and federal (*Fisheries Act, SARA*) acts and regulations.

Within the Project Area, there are no fish-bearing waterbodies or watercourses (HabiSask 2017). Wiwa Creek, which flows from Neidpath through Hodgeville, is a tributary of the Wood River and is known to contain brook stickleback (HabiSask 2017). However, this watercourse is located just beyond the southern boundary of the Project Area. As such, no further assessment of aquatic resources was deemed necessary for the Project as there is no potential for Project effects to occur.

5.4 VEGETATION AND WETLANDS

Plant species (both rare and nuisance) in Saskatchewan are protected or managed under both provincial and federal acts and regulations, including, but not limited to *The Wildlife Act* (Government of Saskatchewan 1998), the federal *SARA* (Government of Canada 2002), and *The Weed Control Act* (Government of Saskatchewan 2010b). Wetland alteration is regulated under the *Water Security Agency Act* (Government of Saskatchewan 2005). These resources include native vegetation and wetlands (as represented by base mapping land cover classes), plant species of management concern (SOMC), and weed species. Generally, plant SOMC include species at risk or nuisance species listed under provincial and federal legislation, and those sensitive species for which there are activity restriction setback guidelines (SKMOE 2015). A specific list of plant SOMC with the potential to occur in the Project Area will be included in the EIS.

The Project is located within a mix of cultivated land, hayland, tame pasture and native prairie, with interspersed areas of development. This section will outline the methods and results of both the desktop review and field surveys in addition to identifying potential effect pathways, mitigation strategies, and residual effects.

5.4.1 Methods

5.4.1.1 Desktop Review

Land cover databases (i.e., AAFC), aerial photography, and literature sources were reviewed for existing data on vegetation and wetlands. The desktop review of databases and literature sources included the identification of historical occurrences of plant SOMC (HabiSask 2017).

5.4.1.2 Baseline Mapping and Classification of Land Cover Classes

Land cover classes were mapped prior to a site reconnaissance visit to verify land cover classes in the Project Area according to categories identified in Table 5-4. Land cover was mapped for the Project Area using the AAFC (2015) database and CanVec (Natural Resources Canada 2016).

Table 5-4 Land Cover Classification

Land Cover Class	Description
Developed	Land that includes buildings in urban and rural areas and farmsteads. Land that is predominantly developed including commercial and industrial plants, gravel pits, and mine structures. Human-constructed routes for vehicles including surfaced/paved highways and non-surfaced trails. Dugouts are included in this category.
Exposed/Barren	Land that is undeveloped and barren of vegetation such as rock outcrops, gravel beds and sand spits.
Water	Watercourses of natural flowing water, directed flowing water, lakes and watering holes.
Wetland	A land area that is saturated with water, either permanently or seasonally, such that it takes on the characteristics of a distinct ecosystem.
Shrubland	Land dominated by woody, multi-stemmed plants or trees larger than 2 m in height.
Native Grassland	Land where the sod layer has never been converted to agricultural production and is dominated by native plant species.
Perennial Hayland	Land sown to perennial grasses and/or legumes and cut annually for hay.
Tame Pasture	Land containing native and possibly introduced plant species and used for livestock grazing.
Broadleaf	Land dominated by deciduous tree species.
Cultivated	Land that is seeded and harvested each year for crops such as wheat, canola and sunflowers.

5.4.1.3 Field Surveys

A field reconnaissance survey was conducted on October 26th to 30th, 2016, with an objective of validating land cover classes determined through desktop mapping methods within the Project Area. Efforts focused on validating native grassland and other natural land cover types, and to differentiate pasture from hayland (forages) that are combined in the AAFC (2015) database. Where possible to view a sufficient extent of a given quarter section, land cover was validated from roadside. Representative photographs of the Project Area from the field reconnaissance survey are presented in Appendix C.

A total of 462 parcels of land were verified within the Project Area during the field reconnaissance survey, where access was possible through public roads. Parcels not verified were inaccessible due to poor road conditions or lack of public access to lands (i.e., an absence of developed grid roads).

5.4.2 Existing Conditions

5.4.2.1 Terrestrial Land Cover

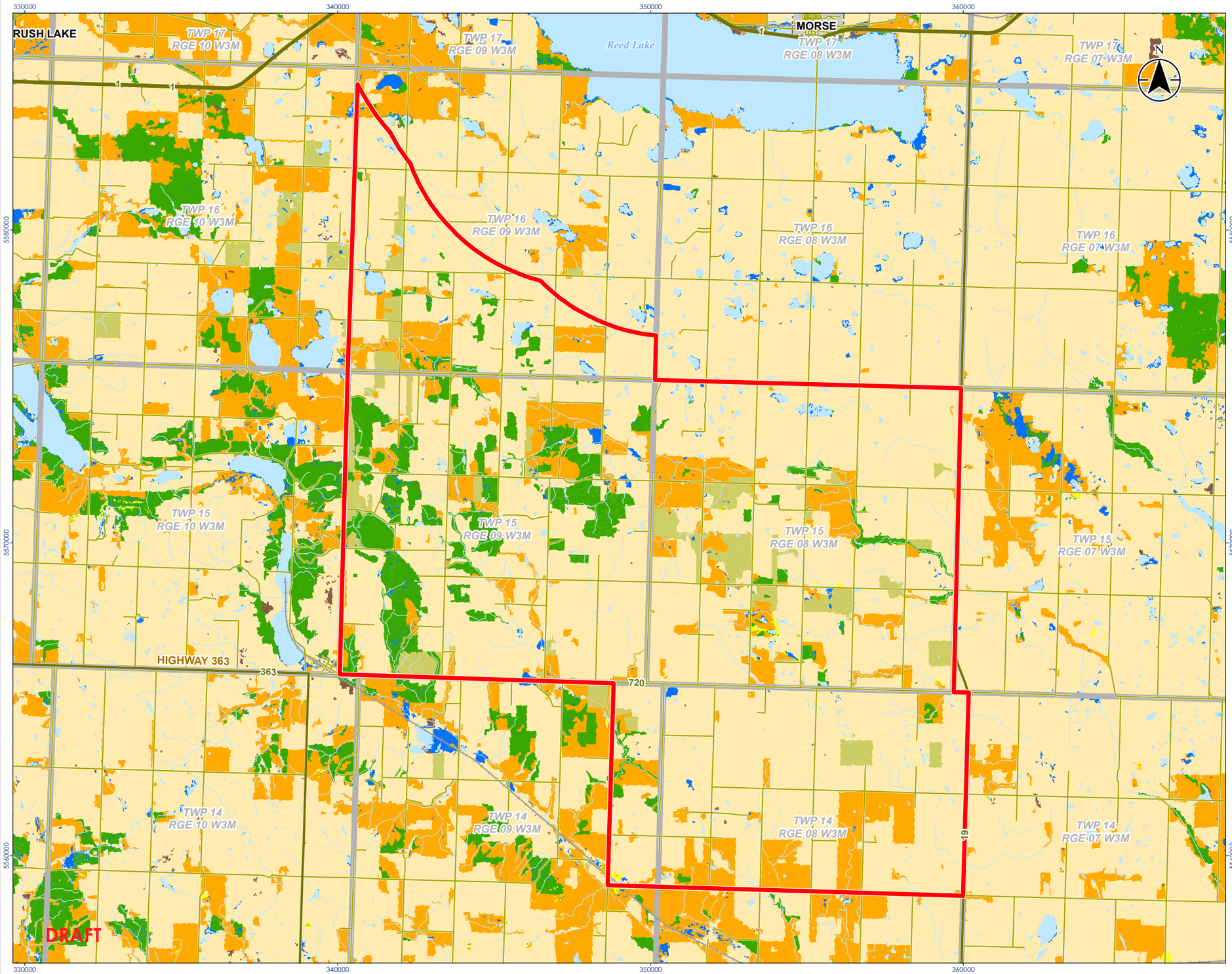
The majority of the Project Area terrestrial land cover consist of cultivated (cropland) (70.4%), followed by tame pasture (13.1%), native grassland (7.8%) and hayland (4.8%). There is also a relatively small amount of developed, shrubland, and exposed/barren land (Table 5-5; Figure 5-2).

The native grassland is mainly found throughout the western portion of the Project Area where the more variable topography (hills and ephemeral drainage coulees) creates challenges to agricultural practices and where soils are less suitable to crop production. The grassland patches within the Project Area are generally smaller remnant patches with an average size of 15.4 ha.

Table 5-5 Land Cover Classes within the Project Area

Land Cover Class[1]	Project Area	
	Area (ha)	**Proportion (%)**
Developed	531.4	1.7%
Exposed Land/Barren	18.5	0.1%
Water	406.2	1.3%
Wetland	186.2	0.6%
Shrubland	44.0	0.1%
Native Grassland	2,381.6	7.8%
Hayland	1,453.2	4.8%
Tame Pasture	3,972.8	13.1%
Broadleaf	0.1	0.0%
Cultivated	21,389.7	70.4%
Total	**30,383.7**	**100.0%**

Note:
[1] Land cover is based on the AAFC (2015) database.



Stantec

Algonquin Power Co.

Land Cover
- Cultivated
- Broadleaf
- Developed
- Exposed Land/Barren
- Hayland
- Native Prairie
- Shrubland
- Tame Pasture
- Water
- Wetland
- Project Area
- Major Road
- Minor Road
- Railway
- Watercourse
- Waterbody
- Town/City
- Township

0 1 2 3 4 Kilometers
1:125,000 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 13N
2. Base features produced under license with the Government of Saskatchewan and the Government of Canada
3. Land cover: Agriculture and Agri-Food Canada, 2015, Canvec 11, Stantec Field Reconnaissance 2016.

Project Location
Near Morse, SK

113254056-012 REVB
Prepared by acory on 2017-01-17
Technical Review by jmdevink on 2017-01-17

Client/Project
Algonquin Power Co.
Blue Hills Wind Energy Project

Figure No.
5-2

DRAFT

Title
Land Cover in the Project Area

G:\active\clients\algonquin_power_services\blue_hills\figures\report\rpp\113254056_012_REVB_landcover.mxd Revised: 2017-01-17 By: acory

5.4.2.2 Wetlands

Based on the AAFC (2015) and CanVec (Natural Resources Canada 2017) datasets, wetlands and water combined represented less than 2% of the landscape in the Project Area. Average wetland polygon and water polygon sizes of those identified within the digital layers available for the Project Area were 0.3 ha and 1.2 ha, respectively. Most wetlands were located in the northern and eastern portions of the Project Area (Figure 5-2) where the landscape has less variable topography and is suitable for smaller wetland basin formation. These regions are also generally where the terrestrial land cover is cropland, and as such provide less suitable basins for upland nesting waterbirds and waterfowl.

The AAFC and CanVec datasets tend to underrepresent the number of wetlands on the landscape. Smaller ephemeral (Class I), temporary (Class II) and seasonal (Class III) wetlands (see Appendix D for definitions) may not hold water at the time imagery used for land cover classification is taken and are often misclassified as terrestrial land cover.

Once the Project layout is completed, wetlands will be delineated on lands where infrastructure is proposed and verified through field studies. This wetland delineation will allow for avoidance of wetlands with Class-appropriate setbacks to reduce or avoid effects to wetland function and plants and wildlife that inhabit the wetlands.

5.4.2.3 Historical Occurrences of Plant SOMC

There were no historical records of plant SOMC within the Project Area (HabiSask 2017) (Figure 5-3). This may be due to the small area of natural land cover types and the absence of SOMC, or to a lack of surveys that have occurred in the area.

5.5 WILDLIFE

Wildlife as an environmental component represents a broad range of wildlife species and habitats that are known to occur or have potential to occur in the vicinity of the Project. There are wildlife species potentially found within the Project Area, with the majority of these species being common and abundant (i.e., not a species at risk [SAR]).

Wildlife is included as an environmental component in the TPP because of the potential of the Project to interact with wildlife and wildlife habitat resources. As well, these resources are recognized as having aesthetic, economic and recreational importance to Canadians (Filion et al. 1993). Furthermore, wildlife is a critical component of functional natural ecosystems. Changes in wildlife abundance or diversity might alter ecosystem function, resulting in negative implications to other environmental features and decreasing the ability of humans to use and enjoy natural resources or to benefit from ecological goods and services. As environmental systems are interrelated, changes in other environmental components (e.g., vegetation and wetlands) could affect wildlife abundance and habitat availability.

Wildlife and their habitat within the Project Area are protected under several provisions of federal and provincial legislation. Acts and their associated regulations dedicated to protecting wildlife and their habitat include the following:

- The *MBCA* (MBCA; Government of Canada 1994)
- The *SARA* (Government of Canada 2002)
- The *Wildlife Act* (Government of Saskatchewan 1998)
- The *WHPA* (Government of Saskatchewan 1992)

Other pieces of legislation also have implications for the protection of habitat features or regulate trade in wildlife, but have less focus on wildlife and wildlife habitat protection in natural landscapes.

The scope of this assessment includes all wildlife species, but focuses on SOMC, including SAR, and their habitat. Generally, wildlife SOMC include species at risk listed under provincial and federal legislation, and those species with sensitive features for which there are activity restriction setback guidelines (SKMOE 2015). A specific list of wildlife SOMC with the potential to occur in the Project Area will be included in the EIS.

For the purposes of the TPP, suitable wildlife habitat includes native land cover classes (i.e., native grasslands, shrublands, deciduous forest, wetlands and waterbodies), as well as perennial cropland, which is an anthropogenic land cover.

5.5.1 Methods

Existing information from provincial and federal databases, remotely-sensed imagery and literature sources were reviewed to identify historical occurrences of SOMC.

The following data sources were reviewed to gather information on SOMC previously reported in the Project Area and designated wildlife conservation lands:

- SKCDC wildlife database (historical SOMC observations and sensitive wildlife habitat features; HabiSask 2017)
- COSEWIC status reports (COSEWIC 2016)
- Species at Risk recovery strategies (Government of Canada 2017)
- Important Bird Areas (IBA) in Canada Online Database (Bird Studies Canada [BSC] 2015)
- Land cover data from the AAFC (2015) database
- HabiSask (2017) database of the Saskatchewan Representative Area Network spatial layer includes Ducks Unlimited Canada project areas, conservation easements, provincial parkland, national parks, national wildlife areas, *Prairie Farm Rehabilitation Act* community pastures, provincial community pastures, ecological reserves, Saskatchewan

watershed authority lands, special management areas, WHPA lands, migratory bird sanctuaries, wildlife refuges, fish and wildlife development fund lands, and games preserves (HabiSask 2017)

Land cover classes described in Table 5-5 (see Section 5.4.2.1) were used to identify the areal extent of suitable wildlife habitat within the Project Area.

5.5.2 Existing Conditions

5.5.2.1 Wildlife Habitat and Sensitive Features

The majority (70.4%; Table 5-5) of the terrestrial component of the Project Area consists of cultivated land with interspersed patches of developed land, wetlands and water, native grassland, shrubland, tame pasture and hayland. While agricultural land cover does provide some habitat requirements for species that use crops as food, it is less useful for breeding of birds and other wildlife due to regular disturbance of agricultural machinery, which may destroy nests and disturb young animals. The areas of natural land cover could provide suitable habitat to a variety of wildlife species, though there is limited extent of large contiguous blocks of suitable habitat for grassland-dependent species, such as burrowing owls (*Athene cunicularia*), ferruginous hawks (*Buteo regalis*) and Sprague's pipits (*Anthus spragueii*). Based on AAFC (2015) there is a small portion (1.9% combined) of the Project Area that also contain wetlands and waterbodies. These would serve as habitat for waterfowl, some species of waterbirds, and amphibians, as well as water sources for terrestrial wildlife species. The areas with higher wetland densities are found primarily in the northern and eastern portions of the Project Area (Figure 5-2).

The Project Area does not overlap any critical habitat defined by Environment and Climate Change Canada in species recovery strategies. It also does not overlap any portions of identified Terrestrial Wildlife Habitat Inventory areas (Hart et al. 1979). This inventory database was one the earliest efforts by the Government of Saskatchewan to identify areas of importance to wildlife species of management concern and game species, and are based on land cover and habitat associations. The nearest areas of Terrestrial Wildlife Habitat Inventory occur along Wiwa Creek, approximately 2 km to the south of the Project Area, where habitat is identified for white-tailed deer (*Odocoileus virginianus*), mule deer (*Odocoileus hemionus*) and ring-necked pheasants (*Phasianus colchicus*).

The Project Area does not overlap any wind energy project avoidance zones identified by SKMOE (SKMOE 2016). The nearest avoidance zone is associated with the Reed Lake IBA 5.0 km to the north of the Project Area. Reed Lake is an IBA for staging migratory aquatic and shorebird species. There are no IBAs or large bodies of aquatic habitat directly south of the Project. The nearest IBA south of the Project Area is the Grasslands National Park located over 100 km away, and which is an IBA for terrestrial species. Therefore, the Project Area is not situated between IBAs and in a potential regional movement corridor of birds.

The areal extent of land cover types that would be directly affected within the Project Area will be determined as part of the Environmental Assessment (EA) once the Project layout is known, as outlined in the TOR (Appendix A).

5.5.2.2 Designated Lands

Within the Project Area there are no designated wildlife conservation lands. The nearest designated land (i.e., WHPA land) is located 1.6 km west of the Project Area boundary.

5.5.2.3 Potential SOMC and Associated Habitat

The land cover within the Project Area potentially serves as habitat for a variety of mammal, bird, amphibian, reptile, and invertebrate wildlife species typically found in the Mixed Grassland ecoregion. Wildlife SOMC in the Mixed Grassland Ecoregion are included as SOMC mostly due to loss of natural land cover, particularly native grassland, that provides essential habitat to sustain populations. The portions of native grassland in the Project Area (7.8%), predominantly in the southwest, may provide habitat for grassland-dependent SOMC, such as ferruginous hawks, Sprague's pipits, burrowing owls, and chestnut-collared longspurs (*Calcarius ornatus*). Reed Lake to the north of the Project Area provides habitat for resident and migrant shorebird, waterbird and waterfowl, including SOMC, during migration or as a destination for breeding purposes..

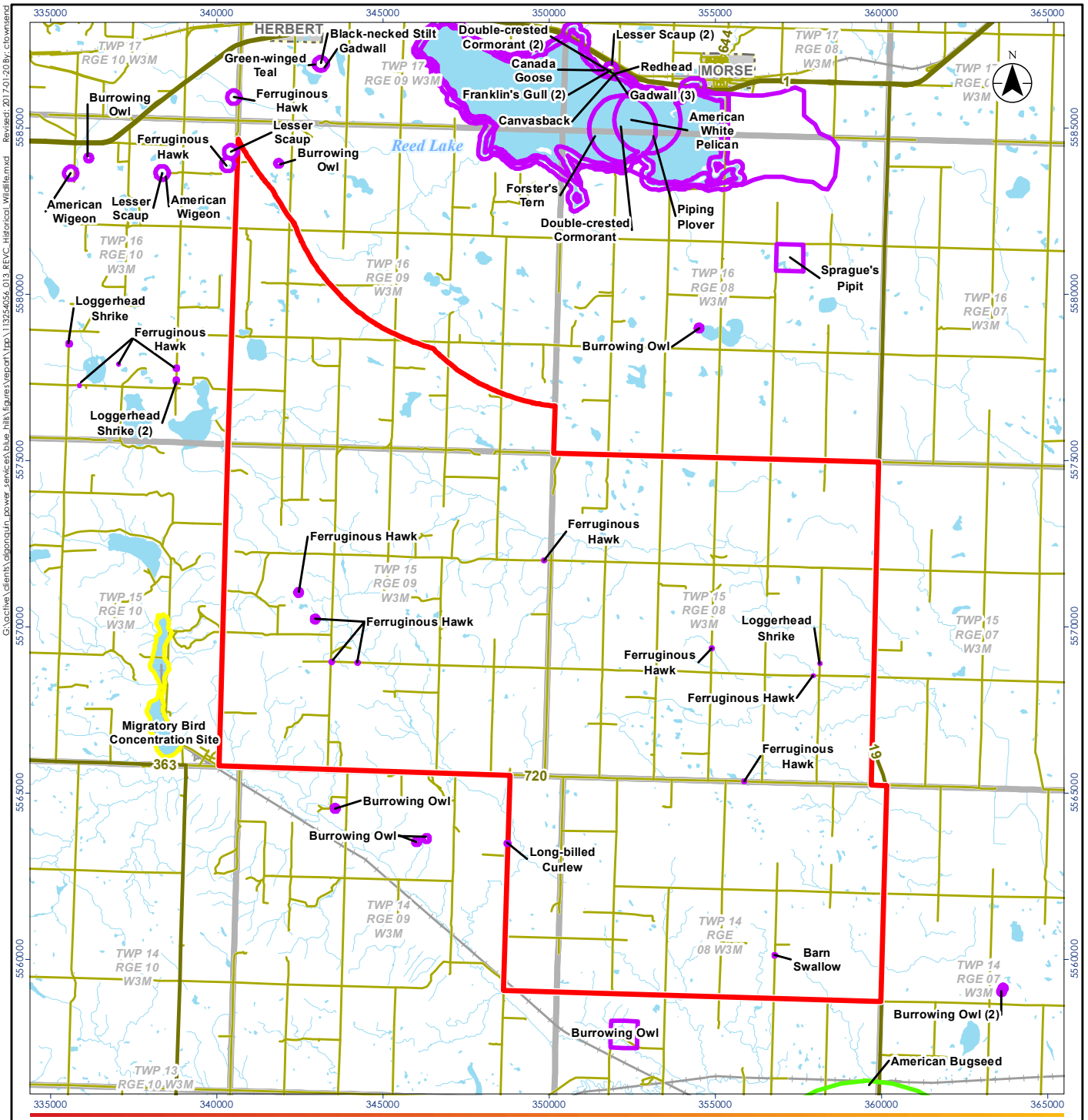
There is potential for one resident bat SOMC in the Project Area, the little brown myotis (*Myotis lucifugus*), as well as several migratory species that may pass through the Project Area between their breeding and wintering grounds. Prairie wind energy projects pose a lower relative risk (as the proportion of fatalities) to resident bat SOMC than do wind energy projects in other parts of Canada (BSC 2016). Site-specific information about bat activity will be obtained for the Project to better understand the potential risk to this species group.

5.5.2.4 Historical Occurrences of Wildlife SOMC

Within the Project Area nine historical occurrences of wildlife SOMC were found, all birds, six of which consisted of ferruginous hawks (HabiSask 2017) (Table 5-6). Most of the ferruginous hawk detections were located along roads, which may represent sightings of individuals in flight and may not represent nests or other more permanent habitat features (Figure 5-3). Regardless of the nature of historical records, they indicate that grassland-dependent species do occur in the Project Area and, depending on their current distribution and the proposed siting of Project infrastructure, may interact with the Project.

Table 5-6 SKCDC Historical Occurrences of Wildlife SOMC within Project Area as searched on January 16, 2017

Common Name	Scientific Name	Total No. of Occurrences in Project Area
Invertebrates		
No invertebrate SOMC were reported in the Project Area		
Amphibians and Reptiles		
No amphibian or reptile SOMC were reported in the Project Area		
Birds		
Ferruginous hawk	*Buteo regalis*	6*
Barn swallow	*Hirundo rustica*	1
Loggerhead shrike	*Lanius ludocivianus excubitorides*	1
Long-billed curlew	*Numenius americanus*	1
Mammals		
No mammal SOMC were reported in the Project Area		
Sensitive Site		
No sensitive sites were reported in the Project Area		
NOTE: *The SKCDC database indicates six unique records for ferruginous hawks; however, three ferruginous hawk locations were identified under one record, as indicated in Figure 5-3.		



Historical Occurrences
- Wildlife Species of Concern
- Rare Plant
- Migratory Bird Site
- Project Area
- Major Road
- Minor Road
- Railway
- Watercourse
- Waterbody
- Town/City
- Township

0 2 4 Kilometers

1:175,000 (at original document size of 8.5x11)

Notes
1. Coordinate System: NAD 1983 UTM Zone 13N
2. Base features produced under license from the Government of Saskatchewan.
3. Historical Occurrences: SKCDC, MOE Rest Services Jan 2017

Stantec

Algonquin Power Co.

Project Location
Near Morse, SK

113254056-013 REVC
Prepared by ctownsend on 2017-01-20
Technical Review by jmdevink on 2017-01-20

Client/Project
Algonquin Power Co.
Blue Hills Wind Energy Project

Figure No.
5-3

Title
SKCDC Occurrence Records in the Project Area as Searched on January 16, 2017

5.6 HERITAGE RESOURCES

In Saskatchewan, *The Heritage Property Act* defines heritage property as pre-contact and post-contact archaeological sites, built heritage sites and structures, and paleontological sites. Heritage resources are the property of the Provincial Crown and are protected under *The Heritage Property Act* (Government of Saskatchewan 1980).

5.6.1 Methods

The Project Area was screened for heritage sensitivity based on the HCB's screening criteria using the Developers' Online Screening Tool.

Heritage sensitivity is determined based on the presence of previously recorded heritage resources, the potential for heritage resources to exist, previous land disturbance, and the nature and scope of the proposed development. Heritage sensitive quarter sections throughout the Project Area are largely concentrated around watercourses and landscape suitable for heritage resources.

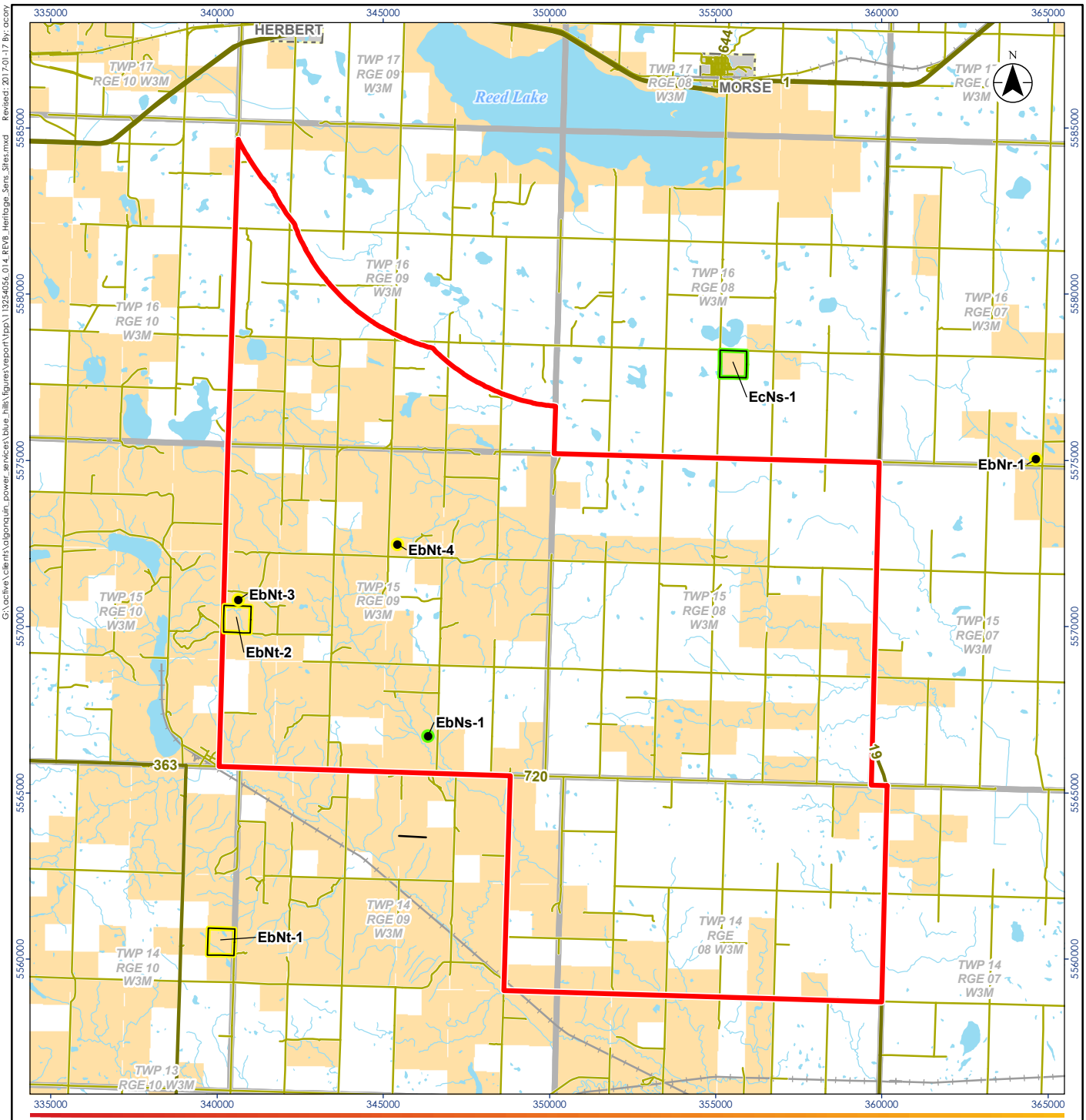
An inventory was requested from HCB to identify previously recorded heritage sites. The inventory data is provided according to National Topographic System (NTS) mapsheets. The Project Area is located on portions of four adjacent NTS mapsheets: 72J/2, 72J/3, 72J/6 and 72J/7.

5.6.2 Existing Conditions

Within the Project Area boundary, there are four recorded heritage resources including two artefact/feature combinations, one artefact scatter and one possible burial (which is designated as a Site of Special Nature).

Of the 470 quarter sections entirely or partially in the Project Area, 202 were identified as heritage sensitive. These quarter sections were found mainly in the western portion of the Project Area where there is a greater abundance of unbroken land. Should Project infrastructure be proposed on these lands, a heritage referral will be submitted to HCB for review. HCB will determine if an HRIA is required, based on the location of proposed Project infrastructure.

An HRIA may identify previously undiscovered heritage resources, which would require mitigation measures approved by the HCB. The preferred mitigation measure of archaeological sites is always avoidance, with setback restrictions being developed in consultation with HCB. If an archaeological site is unavoidable, mitigation measures will be determined by HCB and may range from site sampling to full scale excavation.



- Site of a Special Nature
- Archaeological Site
- Site of a Special Nature
- Archaeological Site
- Potential Heritage Sensitive Land
- Project Area
- Major Road
- Minor Road
- Railway
- Watercourse
- Waterbody
- Town/City
- Township

0 2 4 Kilometers

1:175,000 (at original document size of 8.5x11)

Notes

1. Coordinate System: NAD 1983 UTM Zone 13N
2. Base features produced under license from the Government of Saskatchewan.
3. Known Sites: SK HCB, Sept 2016. Sensitivity: SK HCB, Sept 2010 V1.

Stantec

Algonquin Power Co.

Project Location
Near Morse, SK

113254056-014 REVB
Prepared by acory on 2017-01-17
Technical Review by jmdevink on 2017-01-17

Client/Project
Algonquin Power Co.
Blue Hills Wind Energy Project

Figure No.
5-4

Title
Heritage Sensitive Land and Previous Archaeological Finds in the Project Area

5.7 HUMAN ENVIRONMENT

Human environment includes agricultural activities, groundwater and surface water users, oil and gas and other industrial activities, recreational harvesting activities, non-consumptive recreational activities, employment and economy, and demand for accommodation, community services and transportation infrastructure. The human environment section will outline the methods and results of the desktop review in addition to identifying potential effect pathways, mitigation strategies, and residual effects.

5.7.1 Methods

Existing information from provincial and federal databases, remotely-sensed imagery and literature sources were reviewed to determine baseline information for this assessment. The following sources of information were reviewed:

- Land cover data from the Agriculture and Agri-food Canada's Annual Crop Inventory (AAFC 2015).
- Designated land data from the Representative Areas Network, Saskatchewan Ministry of Environment (HabiSask 2017).
- Rural and urban municipalities, road networks and quarter section data (HabiSask 2017).
- Oil and gas well information from the Vertical Wells Dataset (Saskatchewan Ministry of Economy 2017).
- Groundwater well data from the Water Well Drillers Report Database (Water Security Agency 2017).
- Websites to obtain information about municipalities, if available.
- Population and employment information for the affected areas from the 2011 Community Profiles program (Statistics Canada 2016).

5.7.2 Existing Conditions

5.7.2.1 Rural Municipalities and Communities

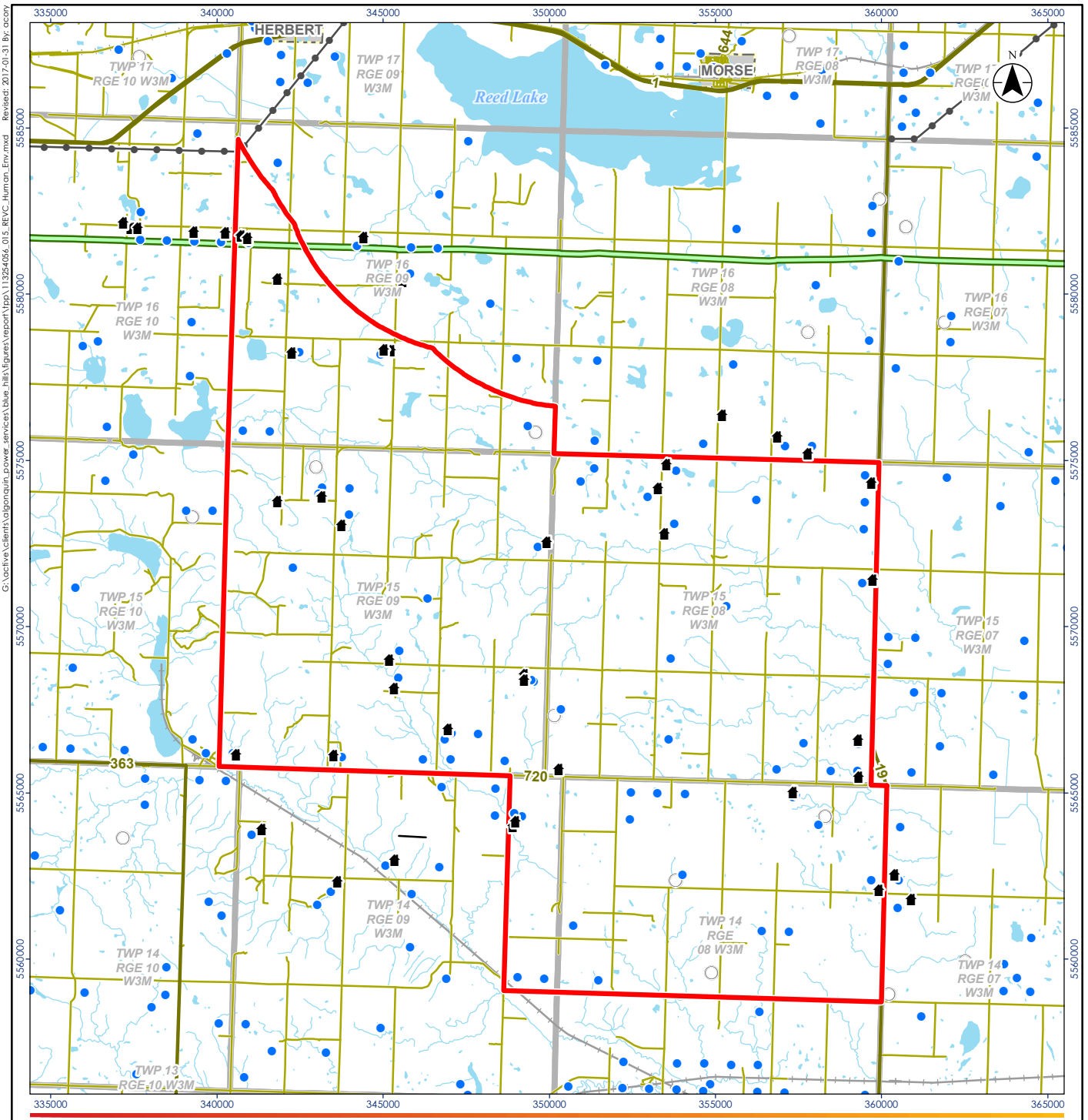
The Project Area overlaps two RMs, Morse (No. 165) and Lawtonia (No. 135). The population of the RM of Morse, exclusive of towns, was 401 in 2011, which is a 7.8% reduction from the 2006 census count of 435. The RM of Lawtonia, however, saw a 22% population increase from 2006 (n = 356) to 2011 (n = 434) (Statistics Canada 2016).

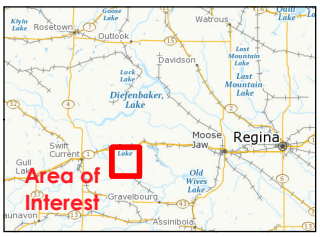
There are no communities located within the identified Project Area (Figure 5-5). Nearby communities and the closest major center are identified in Table 5-7(Statistics Canada 2016).

Table 5-7 Communities in Proximity to the Project Area

Community	RM	Status	Population in 2011 Census[1]	Distance to the Project Area Boundary (km)
Herbert	Morse No. 165	Town	759	3.1
Morse	Morse No. 165	Town	240	6.3
Hodgeville	Lawtonia No. 135	Village	172	5.2
Swift Current	Swift Current No. 137	City	15,503	36.4

Note:
[1] Statistics Canada (2016).





- Residence
- Water Well
- Abandoned Well
- Existing Pipeline
- Existing Transmission Line
- Domestic Waste/Landfill
- Project Area
- Major Road
- Minor Road
- Railway
- Watercourse
- Waterbody
- Town/City
- Township

0 2 4 Kilometers

1:175,000 (at original document size of 8.5x11)

Notes

1. Coordinate System: NAD 1983 UTM Zone 13N
2. Base features produced under license from the Government of Saskatchewan.
3. Infrastructure: GDC, 2016. Water Wells: SK WSA, 2016
4. Residences: Supplied by Algonquin, Jan 2017

Stantec

Algonquin Power Co.

Project Location
Near Morse, SK

113254056-015 REVC
Prepared by acory on 2017-01-31
Technical Review by jmdevink on 2017-01-31

Client/Project
Algonquin Power Co.
Blue Hills Wind Energy Project

Figure No.
5-5

Title
Human Environment Features in the Project Area

5.7.2.2 Land Use

The primary land use within the Project Area is agriculture (88.3%) in the form of cropland, pasture and hayland for livestock production (AAFC 2015) (Table 5-8). Natural land cover types (i.e., not used for anthropogenic purposes) combined, including terrestrial native vegetation and water or wetlands, represents a smaller proportion of the land (9.9%). There is also a small area (1.7%) of developed land, which largely represents roads and rural residential developments.

Table 5-8 Land Use within the Project Area

Land Cover Class[1]	Project Area	
	Area (ha)	Percentage (%)
Cultivated land (including cropland, hayland and seeded pasture)	26,815.7	88.3
Native Vegetation (terrestrial landcover dominated by native vegetation)	2,444.2	8.0
Water (including watercourses and wetlands)	592.4	1.9
Developed[2]	531.4	1.7
Total	**30,383.7**	**100.0**

Note:
[1] AAFC 2015 dataset.
[2] Developed includes roads, barren lands, commercial and industrial development, and residential and municipal areas.

With the exception of two quarter sections, all land within the Project Area is privately owned and do not have special designations or easements. There are two adjacent quarter sections (SE&SW-16-14-08-W3) of crown land located within the Project Area along the southern edge that are used for pasture and haylands (HabiSask 2017).

5.7.2.3 Oil and Gas Activity

There are six abandoned oil or gas well within the Project Area, but no active wells or planned drilling activities (Saskatchewan Ministry of Economy 2017).

5.7.2.4 Groundwater and Surface Water Users

There are 94 groundwater wells identified within the Project Area that may be used as residential or livestock water sources (Water Security Agency 2017). Potential effects to groundwater wells will be evaluated in the EA once the Project layout has been determined as outlined in the TOR (Appendix A).

There are no named surface water bodies within the Project Area that provide recreational or commercial value, such as boating or fishing. Setbacks to Class III-VI wetlands will likely avoid potential effects of the Project on the use of these waterbodies, however, this will be evaluated in the EA (see Appendix A).

Reed Lake is a popular location for migratory bird viewing, however, the Project Area is a minimum of 5 km from the Reed Lake IBA boundary and will not affect the public's ability to use this lake for recreational purposes.

5.7.2.5 Existing Infrastructure

With the exception of agricultural infrastructure, there are no industrial developments within the Project Area.

The nearest high-voltage transmission line to the Project traverses the northernmost quarter section of the Project Area.

Throughout most of the Project Area there is a network of developed grid roads. There are also several numbered Provincial roads, including:

- Route No. 720, which transects the Project Area in the southern portion
- Route No. 612 that transects the western portion of the Project Area
- Highway No. 19 directly adjacent to the east boundary of the Project Area

5.7.2.6 Acoustic Environment

There are approximately 29 residences (i.e., potential noise receptors) within the Project Area (Figure 5-5) based on RM maps and a field assessment conducted in the summer of 2016. Without a Project layout an effects analysis of increased ambient noise levels at nearby noise receptors cannot yet be completed. Noise receptors will be re-verified once a Project layout has been determined and prior to a noise assessment being completed. This potential effect will be evaluated as a component of the EA as outlined in the TOR (Appendix A).

5.7.2.7 Viewscape

In addition to the roads identified within the Project Area (see Section 5.7.2.5), there are two numbered roads where the Project may be visible by passing motorists. These include:

- Route No. 363, which passes 1 km from southwest boundary of the Project Area
- Highway No. 1 approximately 2.3 km north of the Project Area boundary

Once the Project layout is completed, an evaluation of effect of the Project on the viewscape of the region will be completed.

6.0 EFFECTS ASSESSMENT AND MITIGATION

This section gives an overview of the potential effects pathways of the Project located within the Project Area on the environmental components identified in this TPP. This information will be used in the TOR to identify the scope of components of the environment and their assessment in the EA (Appendix A).

6.1 TERRAIN AND SOILS

Effect pathways that could result in an effect of the Project on terrain and soil include changes in terrain integrity and soil quality and quantity. Terrain integrity includes surface expressions (i.e., hummocky) that are influenced by changes in slopes. A change in soil quality can be measured as change in agricultural capability that is based on a number of soil features including soil classification, texture, topsoil depth, erosion, salinity and stoniness. Each effect pathways is considered below.

6.1.1 Terrain

The nature of construction activities associated with a wind energy project, and the lack of steep slopes or terrain features in the Project Area means that adverse effects to terrain stability within the Project Area are not likely to occur.

6.1.2 Soils

Construction, operation and maintenance and decommissioning of a Wind Energy Project would have the potential to affect soils within the Project Area through a change in soil quality or change in soil quantity. The potential for effects would be greatest during the construction phase, followed by the decommissioning phase. During operation and maintenance there is little potential for effects to soils.

6.1.2.1 Change in Soil Quality

Several mechanisms may result in changes to physical or chemical properties that can affect soil capability, such as admixing, salinization, increased stoniness, compaction and rutting, and soil erosion.

- **Admixing** refers to the dilution of topsoil with subsoil, spoil or waste material, with the result that topsoil quality is reduced (Powter 2002). Admixing can result in adverse changes in topsoil texture, soil aggregation and structure, organic matter content, and consistence.
- **Salinization** may occur through the admixing of non-saline topsoil with saline subsoil or non-saline upper subsoil with saline lower subsoil.

- **Stoniness** of surface soils may be increased through soil disturbance and poor soil handling. Surface stones can interfere with tillage, planting and harvesting, and in so doing reduce soil capability.
- **Compaction and Rutting** of topsoil and subsoils may occur through heavy equipment traffic in construction areas and result in reduced soil porosity and adversely affect soil structure and permeability in the rooting zone. Reduced soil permeability and poor soil structure adversely affect soil capability.
- **Soil Erosion** through wind and water may affect the soil quality and productivity during and following construction activities through the loss of fine soil particles and organic matter.

During Project operation and maintenance activities there is limited potential to cause soil compaction and rutting. Any such effect may occur if maintenance is required along buried collector lines.

There are well-established best management practices that can help mitigate effects on soil quality and will be included, as appropriate, in the EA when further details on Project activities are known.

6.1.2.2 Change in Soil Quantity

As with a potential change in soil quality, change in soil quantity is most likely to occur during the construction and decommissioning phases of the Project when ground disturbance and heavy equipment operations occur. There is no anticipated potential for change in soil quantity during the operation and maintenance phase of the Project.

Erosional loss, which is a natural process occurring at rates depending on the interaction of precipitation, texture, topography and vegetation factors, can occur through disturbance of soils and poor soil handling procedures.

There are well-established best management practices to reduce or avoid effects on soil quantity and will be included, as appropriate, in the EA when further details on Project activities are known.

6.2 VEGETATION AND WETLANDS

Project activities during all three phases have the potential to cause an adverse effect on vegetation and wetlands within the Project Area. Potential effects pathways include:

- Change in native vegetation and wetland abundance and distribution
- Change in plant SOMC abundance and distribution

These effects, and mitigation measures to reduce or avoid these effects, are described below.

6.2.1 Change in Native Vegetation and Wetland Abundance and Distribution

Vegetation clearing during construction may cause a change in native vegetation and wetlands abundance and distribution in the Project Area. This would include, for example, areas required for turbine pads and access roads. The duration of these effects would be for the life of the Project until decommissioning when reclamation of native land cover returns the Project footprint to its former land cover type to the extent possible. Collector lines placed between turbines would have a short-term effect on land cover as the infrastructure is buried and does not require regular maintenance and continued ground disturbance. Mitigation, such as revegetation, would help reduce or avoid effects where collector lines are placed.

There is no anticipated potential for a change in native vegetation and wetland abundance and distribution during the operation and maintenance phase.

The Project Area consists primarily (70.4%) of cultivated land with an additional 1.7% developed and 4.8% in hayland. Less than 25% of the land in the Project Area consists of natural land cover types. Siting of the Project will consider the distribution of natural land cover types to reduce or avoid a change in native vegetation and wetland abundance and distribution (Appendix A).

6.2.2 Change in Plant SOMC Abundance and Distribution

Construction activities of the Project could result in a change in the abundance and distribution of plant SOMC in the Project Area, through direct loss or through the introduction of invasive and noxious weed species. Equipment and vehicles could spread invasive or non-native species during construction or during reclamation of temporary work sites. Many invasive and non-native species aggressively invade disturbed areas and may out-compete native vegetation species during reclamation.

During the operation and maintenance and decommissioning phases, there is limited potential to have direct effects to plant SOMC, though there is the potential to introduce noxious weed and invasive plant species.

While there were no records of plant SOMC within the Project Area, appropriate field surveys will be conducted and scoped based on the proposed Project layout to obtain site-specific baseline information. Avoidance of plant SOMC in accordance with recommended activity restriction setback guidelines will help to avoid potential changes in plant SOMC abundance and distribution. Standard industry practices, along with Project-specific mitigation measures for the prevention and monitoring of weed species, will be implemented during construction, operation and maintenance, and decommissioning.

6.3 WILDLIFE

The Project may result in effects to wildlife through direct and indirect changes in habitat availability or through a change in mortality risk. Direct changes in habitat availability (i.e.,

change in land cover) will occur primarily during the construction phase with indirect changes (e.g., sensory disturbance) occurring during all Project phases. Changes in mortality risk are most likely to occur during the operation and maintenance phase, though risks to some species may occur during construction and decommissioning phases, depending on the timing of those activities and the land cover they occur in.

6.3.1 Change in Habitat Availability

Habitat availability refers to the existence of conditions suitable for the life requirements of wildlife. As such, availability of suitable habitat is important to the persistence of wildlife species at both a local and regional scale. Habitat change can occur:

- Directly through the removal or disturbance of habitat, including critical habitat and residences, due to construction activities
- Indirectly through changes in habitat effectiveness caused by sensory disturbance (i.e., from WTG operation), or avoidance of the PDA (e.g., disturbance from vehicles along roads)
- Indirectly through habitat fragmentation that results from loss of connectivity between habitat patches through barriers to movement and dispersal

The majority of the Project Area consists of cultivated or developed land (72.1% combined; Table 5-5), which are less suitable land cover types for the habitat requirements of most wildlife SOMC than are native land cover (i.e., native grassland, shrubland and wetlands). While hayland (4.8% of the Project Area) is suitable habitat for some species of wildlife, it does undergo regular disturbance from farming practices to seed and harvest the forage crops. The abundance of wetlands and water in the Project Area also represents a relatively small area (1.9% of Project Area). Avoidance of wetlands will be considered in the design of the Project layout.

Indirect habitat loss may occur across larger areas (than direct loss) through Project sensory disturbance. Studies in the United States and Europe have found birds avoid wind turbines at distances of 0 to 800 m depending on the season and species (Kingsley and Whittam 2005; Drewitt and Langston 2006). The extent of indirect habitat loss will depend on the locations of Project infrastructure in relation to suitable wildlife habitat within the Project Area.

The Project Area is located outside of any wind energy project avoidance zones (SKMOE 2016). There are no designated conservation lands, critical habitat for *SARA*-listed species, or Terrestrial Wildlife Habitat Inventory lands within the Project Area. As such, there is lower potential to cause effects to land cover recognized as providing important habitat to SOMC. The Project Area is not located between IBAs, where habitat connectivity of these designated wildlife features may occur at a regional scale.

Given the relatively small portion of the Project Area that constitutes natural terrestrial habitat types of native grassland, shrubland, broadleaf forest and tame pasture (21.1%), there is the potential to reduce or avoid a change in wildlife habitat availability through siting of infrastructure in less suitable land cover types. The extent of effects to habitat availability will be assessed in the EIS once the proposed Project layout is determined as outlined in the TOR (Appendix A).

6.3.2 Change in Mortality Risk

Project activities may result in the increase in mortality risk to wildlife species during all phases of the Project.

Project construction has the potential to result in increased direct mortality risk for wildlife. In particular, clearing of vegetation can result in the destruction of migratory bird nests, raptor nests, snake hibernacula, amphibian overwintering areas, as well as breeding areas, den sites and burrows for various wildlife species. Ground-nesting birds are particularly vulnerable during construction activities in open fields throughout breeding periods primarily through the destruction of nests.

There is also increased mortality risk due to potential vehicle collisions in the Project Area associated with increased vehicle traffic. Reptiles and amphibians may undergo daily movements or seasonal migrations. In addition, snake mortality can occur because they tend to bask on roads where there is often increased solar exposure. Granivorous birds using roads to obtain grit for digestion may also be at increased risk of collision as a result of the Project (Bishop and Brogan 2013). Low-flying birds and bats may be exposed to increased mortality risk through interactions with Project facilities, construction equipment and vehicles during migration (Johnson et al. 2003; Machtans et al. 2013). Disturbance from noise and illumination may also cause indirect increases in mortality risk through increases in predation. Mitigation measures to reduce the potential for vehicle collisions with wildlife include, but are not limited to:

- Timing construction to avoid periods of high movement and wildlife activity
- Reduced speed in construction areas
- Monitoring for wildlife occurrences and potential interactions with the Project activities during construction in locations and during periods when wildlife movement is expected (e.g., during spring and fall movement of frogs from breeding ponds).

While collisions with vehicles associated with the Project may continue to occur during the operation and maintenance phase, the mechanisms with the greatest potential to cause a change in mortality risk during this project phase is through collisions of birds and bats with wind turbines.

On average, wind energy projects in Canada (n = 43) have an annual avian mortality rate of 8.2 ± 1.4 (95% CI) birds/turbine (Zimmerling et al. 2013), although the number of birds will vary

with each wind farm. Several factors may influence the collision risk of birds and bats with WTGs. Certain landforms (e.g., ridges, steep slopes, valleys, shorelines) can funnel bird movements, especially during migration, leading to an increased level of interaction between turbines and birds. Topographic features are one of the most important factors that influence raptor collisions with turbines (Kingsley and Whittam 2005). However, wind-energy facilities located within flat prairie landscapes typically have a relatively lower bird and bat mortality rate than wind-energy facilities located in adjacent landscapes with topography such as forested ridges and large rivers (Arnett et al. 2007; Arnett et al. 2008; Baerwald and Barclay 2009). As these topographic features are largely absent in the Project Area, landscape features are unlikely to play a role in mortality risk to birds or bats.

Zimmerling and Francis (2016) estimated bat fatality rates at wind energy facilities by province across Canada. The average bat fatality rate of facilities in Saskatchewan were 11.7 bats/turbine per year, which is a similar value to Alberta at 10.9, both of which were higher than the BSC (2016) estimate of 8.3 ± 2.5 (95% CI). This was likely due to the search extent for the BSC report being limited to 50 m from the turbine and Zimmerling and Francis (2016) correcting this to a larger search area. While Zimmerling and Francis (2016) did not provide region-specific breakdown of species composition, BSC (2016) estimated that 95% of bat fatalities in Alberta were of migratory bat species (i.e., hoary bats, silver-haired bat, eastern red bat). Bat SOMC only include resident bats, and as the proportion of bat fatalities from wind energy projects in the Prairies represents only 5%, the mortality risk to this species is relatively low.

While there are no site-specific data on bird abundance and movement within the Project Area or bat activity rates, detailed studies will be conducted in support of the EIS as outlined in the TOR (Appendix A). Detailed mitigation and monitoring plans to reduce or avoid effects of the Project on Wildlife and their habitat will also be provided in the EIS. With this information and the proposed Project layout an assessment of the potential for the Project to cause a change in mortality risk will be conducted as part of the EIS.

6.4 HERITAGE RESOURCES

In general, changes to heritage resource sites may occur during the construction phase through loss or disturbance of site contents and site contexts from construction activities such as topsoil removal, compaction, heavy equipment and vehicle traffic, grading, and mole-ploughing.

Changes to heritage resource sites are generally confined to the area of ground disturbance and construction activities and can be appropriately mitigated prior to construction through conducting an HRIA. This is the standard required by the HCB under Section 63 of the *Heritage Property Act* (Government of Saskatchewan 1980). Furthermore, in the event that heritage resource sites or objects thought to be heritage resources are found during construction (i.e., accidental discoveries), appropriate mitigation measures identified and implemented on site can reduce Project-related effects to heritage resource sites (i.e., avoidance or mitigatory excavation and curation [i.e., "salvage archaeology/palaeontology"] of heritage sites discovered as directed by HCB).

Mitigation of heritage resource sites can be obtained through avoidance of known sites or controlled archaeological excavation of sites (or portions of sites). Mitigation measures are determined through HCB review of HRIA reports detailing results of the archaeological assessment conducted for the Project.

Mitigation measures will include:

- Avoidance of known heritage resource sites, if possible.
- Controlled archaeological excavation of known heritage resource sites, or a portion thereof, that cannot be avoided (as per HCB direction).
- Heritage resource site construction monitoring by a professional archaeologist in areas of high heritage resource potential or in proximity to know heritage resource sites.
- Ban on artifact collection by Project workers.
- Fencing of any heritage resource sites near the Project footprint that may be vulnerable to secondary effects.
- Evaluation of any route change or added Project components.

Additional mitigation measures may be required following completion of the Project HRIA and will be identified in the Project's environmental protection plan.

6.5 HUMAN ENVIRONMENT

The Project will provide positive opportunities for employment through direct labour associated with construction and operation and maintenance of the Project and with businesses in the surrounding communities. A total of 45 to 90 person-years of employment are expected for Project construction. There will also be approximately 15 to 20 full-time employees hired locally and regionally. As there is a limited workforce available within the Project Area, new workers will likely be brought into the region, although local employees may be hired, on an as-required basis.

The increase in workers during the construction phase will increase demand on local and regional essential and non-essential services, such as accommodations, restaurants, emergency services and healthcare centers. Demands for services will increase potential revenue for local businesses in communities outside the Project Area. The education and income of employees is expected to shift towards more skilled work with the potential for higher annual income. In general, the Project will contribute to the tax revenue and gross domestic product of the province.

The construction phase of the Project will have relatively short-term effects, since construction is expected to last for approximately 12-18 months, while the potential effects from the operation and maintenance phase of the Project will be long-term and occur throughout the duration of the Project.

The local economic effect during construction reflects the capital-intensive nature of wind energy developments. Capital costs associated with the purchase of WTGs and related machinery (from outside of the Project Area) will constitute the majority of costs related to the Project. Construction materials will account for a large portion of the remaining costs, and will likely involve local businesses with the ability to provide construction services for Project components such as road construction, gravel and sand supply, concrete foundations, electrical installations, O&M building, security and fencing, and accommodations and food.

The Project will increase local revenue through property taxes and use of services and consumption of goods. Fixed annual payments for other Project related infrastructure (e.g., roads, collector substation and O&M building) and variable annual payments to landowners (based on energy production) will benefit the local community.

Changes in land use by the Project within the Project Area will be distributed, and will not occur in one concentrated location. As the density of turbines is limited for operational purposes, land use within any given quarter section will not be affected on a wholesale level. Current land uses, such as cultivation of crops, within those quarter sections will continue, but on a reduced land base.

Oil and gas activities and groundwater wells will not be impacted by the Project as they will be avoided.

Wind turbines cause an increase in noise levels to variable distances depending on the turbine design, landscape and topography. The Project may have effects on ambient noise within the Project Area, however, mitigation through identification of noise receptors and siting of infrastructure will reduce or avoid effects. A detailed noise assessment will be completed and included in the EIS as described in the TOR (Appendix A).

The Project Area is located in a rural setting with no communities located within its boundary. However, there are three communities and four numbered highways within or in close proximity (i.e., within 10 km) to the Project. Therefore, the Project infrastructure will be noticeable on the landscape and change the viewscape in the region.

7.0 CUMULATIVE EFFECTS ASSESSMENT

Cumulative adverse environmental effects are effects predicted to result from the Project's residual effects that may act in combination with the potential residual effects of other past, present, or reasonably foreseeable future projects or physical activities.

Two conditions must be met for the Project's activities to contribute to cumulative adverse effects on environment components in the Project Area:

- There are residual Project-related adverse effects on the environmental component; and
- These residual Project-related effects act cumulatively with adverse effects of other past, present, or reasonably foreseeable future projects or physical activities.

As the objective with this TPP is to identify the likely effects of the Project on the environment to assist with properly scoping the TOR for the EA, Project-related effects have not been assessed in a detailed or quantitative manner. As such, a cumulative effects assessment cannot be completed for the TPP. The objective of this cumulative effects assessment section is to identify the potential for cumulative effects and discuss the approach that will be applied in the EIS (see Appendix A).

It is likely that the Project will have residual adverse effects on environmental components identified in this TPP. The significance of those effects is to be determined in the EIS as the Project's activities and layout are not presently known and therefore effects could not be assessed in the TPP.

The adverse residual effects of the Project will be determined at a spatial scale of the local assessment area determined for each valued component of the environment. As effects may extend beyond the footprint of the Project layout, and those of other projects and activities on the landscape may also extent beyond their direct area of impact, cumulative effects assessments will be completed at the scale of the regional assessment area. Spatial boundaries for the cumulative effects assessment completed in the EA will be defined in the EIS.

Past and present projects and activities on the landscape that may act in a cumulative manner to the Project may include:

- Agricultural activities and land conversion
- Linear developments (e.g., roads, rail ways, transmission lines, pipelines)
- Resource extraction activities (e.g., oil and gas wells, mines, aggregate quarries)
- Other renewable energy projects (e.g., Morse Wind Energy Project)

As the Project layout is not yet defined, reasonably foreseeable future projects that would be included in a project inclusion list for the cumulative effects assessment have not yet been identified. However, the list would likely include SaskPower's Pasqua-Swift Current 230 kV

transmission line project as the only known future project planned in relative close proximity (10 km) to the Project Area. The complete project inclusion list and cumulative effects assessment will be identified and completed in the EIS.

8.0 ENVIRONMENTAL MONITORING

As the Project layout is unknown, effects that may require monitoring are also yet unknown. As with other wind energy projects, fatality monitoring of birds and bats will be included. However, the details and monitoring effort can only be determined once the Project layout are known.

Algonquin Power will commit to developing an environmental monitoring program in collaboration with SKMOE to address uncertainties around effects of the Project during construction, operation and maintenance and decommissioning phases. Monitoring will be focused on those VCs where adverse residual effects are predicted to occur.

As wind energy projects have been constructed in many regions of Canada, including the prairie Provinces, the monitoring program will apply reasonable approaches and protocols that have been demonstrated as effective for monitoring effects of these past projects.

The monitoring program will be included as a component of the EIS as described in the TOR (Appendix A).

9.0 CONCLUSION

Algonquin is proposing to construct a 177 MW wind energy facility located approximately 7 km south of Herbert, SK, in the RMs of Morse and Lawtonia. The Project will consist of approximately 42 to 88 WTGs, depending on the selected turbine type, and associated infrastructure, including roads and electrical collector lines. The number of WTGs may change as the Project layout is finalized. Construction of the Project is anticipated to begin in 2019 with commissioning in 2020.

Algonquin has chosen to "opt in" to the environmental assessment process (i.e., self-declare that the Project is a development) and forgo a Ministerial Determination for the Project. As such, Algonquin has developed this TPP and draft TOR (Appendix A) for review. The intent of this TPP is to give SKMOE information about the Project, its location, and scoping of issues to be assessed as part of the environmental assessment process, as described in the draft TOR. It does not provide the full framework for assessing Project-specific environmental effects but does provide a high-level discussion of potential effect pathways and mitigation measures for those environmental components that are most likely to be affected by the Project.

The Project is located within the Mixed Grassland ecoregion. The majority of the Project Area consists of moderate or gentle slope classes (43.6% and 32.6% of the Project Area, respectively) that would not limit Project construction. Soils in the Project Area are primarily of the Chernozemic soil order and most have a Class 4 (severe limitations) soil agricultural capability rating, with moisture being the most common limiting factor. The Project is not expected to affect terrain integrity, and with mitigation, residual effects on soil quality are not expected.

There are no fish-bearing waterbodies or watercourses within the Project Area. As such, no further assessment of aquatic resources was deemed necessary for the Project as there is no potential for Project effects to occur.

The majority of the Project Area consists of cultivated land (70.4%). Native grassland (7.8%) is mainly found throughout the western portion of the Project Area and generally consists of smaller remnant patches associated with areas less suitable for crop production (e.g., hills and ephemeral drainage coulees). Wetlands and water combined represent less than 2% of the landscape in the Project Area; these features will be field verified. The potential effects pathways include a change in native vegetation and wetland abundance, and a change in plant SOMC abundance and distribution. It is expected that these effects can be reduced or avoided through proper siting of infrastructure and appropriate mitigation measures, but residual effects may still occur depending on the Project layout. The extent of potential effects on vegetation and wetlands will be assessed further in the EIS, as outlined in the TOR (Appendix A).

Areas of natural land cover (e.g., native grassland, pasture, wetlands) within the Project Area may provide suitable habitat to a variety of wildlife species, including SOMCs such as Sprague's pipit, burrowing owls, and chestnut-collared longspur. The Project may result in effects to wildlife through direct and indirect changes in habitat availability or through a change in mortality risk.

The extent of these potential effects will be assessed in the EIS, as outlined in the TOR (Appendix A).

Within the Project Area boundary, there are four recorded heritage resources including two artefact/feature combinations, one artefact scatter and one possible burial (which is designated as a Site of Special Nature). Once the Project layout is known, a referral will be submitted to HCB to determine if an HRIA is required. To fulfill the requirements of the *Heritage Property Act*, all heritage resources must be avoided or mitigated fully under the direction of the HCB. If an archaeological site is unavoidable, mitigation measures will be determined by HCB and may range from site sampling to full scale excavation.

The Project will use proven and accepted mitigation measures for wind energy projects in Saskatchewan, and across Canada. Algonquin is committed to incorporating environmental management approaches and strategies into Project planning and execution so that the Project is compliant with regulatory requirements and avoids or reduces potential negative effects to the environment. The incorporation of environmental management tools into Project planning and execution will occur in several ways, including in the design and location of Project components, consulting with provincial regulators and stakeholders to better understand the issues that are of most concern to them, avoidance or mitigation of potential effects on remaining natural features (include committing to conducting pre-construction surveys), and through development of an EPP.

10.0 REFERENCES

Acton, D.F., G.A. Padbury, C.T. Strushnoff, L. Gallagher, D. Gauthier, L. Kelley, T. Radenbaugh and J. Thorpe. 1998. The Ecoregions of Saskatchewan. Canadian Plains Research Centre, University of Regina, Regina SK.

Agriculture and Agri-Food Canada (AAFC). 2009. Saskatchewan Soil Resource Database User's Manual for SKSID (Draft Copy). Saskatchewan Research Centre, Saskatchewan Land Resource Unit. 2009. Saskatoon, SK.

AAFC. 2015. AAFC Annual crop inventory. Available at: http://www.agr.gc.ca/atlas/supportdocument_documentdesupport/aafcCropTypeMapping/en/ISO%2019131_AAFC_Annual_Crop_Inventory_Data_Product_Specifications.pdf. Accessed: December 2016.

Arnett, E.B., D.B. Inkley, D.H. Johnson, R.P. Larkin, S. Manes, A.M. Manville, R. Mason, M. Morrison, M.D. Strickland, and R. Thresher. 2007. Impacts of Wind Energy Facilities on Wildlife and Wildlife Habitat. Issue 2007-2. The Wildlife Society, Bethesda, Maryland.

Arnett, E.B., W.K. Brown, W.P. Erickson, J.K. Fiedler, B.L. Hamilton, T.H. Henry, A. Jain, G.D. Johnson, J. Kerns, R.R. Koford, C.P. Nicholson, T.J. O'Connell, M.D. Piorkowski, and R.D. Tankersley, Jr. 2008. Patterns of Bat Fatalities at Wind Energy Facilities in North America. The Journal of Wildlife Management 72: 61-78.

Baerwald, E.F. and R.M.R. Barclay. 2009. Geographic variation in activity and fatality of migratory bats at wind energy facilities. Journal of Mammalogy 90:1341-1349.

Bird Studies Canada (BSC). 2015. Important Bird Areas in Canada Database. Port Rowan, Ontario: Bird Studies Canada. Available at: http://www.ibacanada.ca. Accessed: January 2017.

BSC. 2016. Wind Energy Bird and Bat Monitoring Database: Summary of the Findings from Post-construction Monitoring Reports. Bird Studies Canada, Canadian Wind Energy Association, Environment Canada and Ontario Ministry of Natural Resources. July 2016. Available at: http://www.birdscanada.org/resources/wind/Jul2016_Wind_database_summary.pdf Accessed: January 2017.

Bishop, C. A., and J. M. Brogan. 2013. Estimates of avian mortality attributed to vehicle collisions in Canada. Avian Conservation and Ecology 8(2): 2.

Canada Land Inventory (CLI). 1972. Soil Capability Classification for Agriculture. Department of Economic Expansion. Ottawa, ON. Report No. 2.

CanWEA. 2014. Wind Energy Markets – Installed Capacity. Available at: http://canwea.ca/wind-energy/installed-capacity/. Accessed: January 2017.

COSEWIC. 2016. Canadian Wildlife Species at Risk – October 2016. Available at: http://www.registrelep-sararegistry.gc.ca/default.asp?lang=En&n=6A538543-1 . Accessed: January 2017.

Drewitt, A.L. and R.H.W. Langston. 2006. Assessing the impacts of wind farms on birds. Ibis 148 (Suppl. 1): 29-42.

Environment Canada (EC). 2013. Bird Conservation Strategy for Bird Conservation Region 11 in the Prairie and Northern Region: Prairie Potholes – Abridged Version. Government of Canada, Environment Canada. 24 pp. Available at: https://www.ec.gc.ca/mbc-com/default.asp?lang=En&n=47D1FA51-1. Accessed: January 2017.

Filion, F.L., E. DuWors, P. Boxall, P. Bouchard, R. Reid, P.A. Gray, A. Bath, A. Jacquemot and G. Legare. 1993. The importance of wildlife to Canadians: highlights of the 1991 survey. Canadian Wildlife Service, Environment Canada. Ottawa, ON.

Government of Canada. 2002. *Species at Risk Act* (S.C. 2002, c.29). Last amended: May 15, 2015. Available at: http://laws-lois.justice.gc.ca/eng/acts/S-15.3/. Accessed: January 2017.

Government of Canada. 1994. *Migratory Birds Convention Act* (S.C. 1994, c.22). Last amended: December 10, 2010. Available at: http://laws-lois.justice.gc.ca/PDF/M-7.01.pdf. Accessed: January 2017.

Government of Canada. 2017. Species at Risk Public Registry. Government of Canada, Environment Canada. Available at: http://www.sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1. Accessed: January 2017.

Government of Saskatchewan. 1980. *The Heritage Property Act* (Chapter H-2.2). Last amended: May 14, 2014. Available at: http://www.publications.gov.sk.ca/details.cfm?p=558&cl=5. Accessed: January 2017.

Government of Saskatchewan. 1992. *The Wildlife Habitat Protection Act* (Chapter W-13.12). Last amended: May 20, 2010. Available at: http://www.publications.gov.sk.ca/details.cfm?p=939. Accessed: January 2017.

Government of Saskatchewan. 1998. *The Wildlife Act, 1998* (Chapter W-13.12). Last amended: May 14, 2015. Available at: http://www.qp.gov.sk.ca/documents/English/Statutes/Statutes/W13-12.pdf. Accessed: January 2017.

Government of Saskatchewan. 2005. *The Water Security Agency Act* (Chapter W-8.1). Last amended: May 14, 2015. Available at: http://www.publications.gov.sk.ca/details.cfm?p=68084. Accessed: January 2017.

Government of Saskatchewan. 2010a. *The Environmental Management and Protection Act, 2010* (Chapter E-10.22). Last amended: May 14, 2014. Available at: http://www.publications.gov.sk.ca/details.cfm?p=31893. Accessed: January 2017.

Government of Saskatchewan. 2010b. *The Weed Control Act* (Chapter W-11.1). Available at: http://www.qp.gov.sk.ca/documents/English/Statutes/Statutes/W11-1.pdf. Accessed: January 2017.

Government of Saskatchewan. 2012. Restoration of Saskatchewan's Agricultural Crown Rangelands – Guidelines and Procedures for Developers. Available at: http://www.publications.gov.sk.ca/details.cfm?p=76956. Accessed: January 2017.

Government of Saskatchewan. 2015. *The Environmental Management and Protection (Saskatchewan Environmental Code Adoption) Regulations* (Chapter E-10.22 Reg 2). Last amended: June 2, 2015. Available at: http://www.publications.gov.sk.ca/details.cfm?p=73308. Accessed: January 2017.

HabiSask. 2017. HabiSask Application. Available at: http://www.biodiversity.sk.ca/HABISask.htm. Accessed: January 2017.

Hart, R. T., S. R. Barber, G. W. Pepper, and H. A. Stelfox. 1979. Terrestrial Wildlife Habitat Inventory of Agricultural Saskatchewan. Available through the HabiSask (2017) online database.

Johnson, G.D., W.P. Erickson, M.D. Strickland, M.F. Shepard and D.A. Shepard. 2003. Mortality of bats at a large-scale wind power development at Buffalo Ridge, Minnesota. American Midland Naturalist 150: 332-342.

Kingsley, A. and B. Whittam. 2005. Wind Turbines and Birds: A Background Review for Environmental Assessment. Draft report for Environment Canada, Canadian Wildlife Service, Quebec. 81 pp. Available at: http://www.energy.ca.gov/windguidelines/documents/other_guidelines/2006-05-12_BCKGRD_ENVIRMTL_ASSMNT.PDF. Accessed: November 2014.

Machtans, C.S., C.H.R. Wedeles and E.M. Bayne. 2013. A first estimate for Canada of the number of birds killed by colliding with building windows. Avian Conservation and Ecology 8: 6.

Natural Resources Canada. 2016. CanVec database. Available at: http://www.nrcan.gc.ca/earth-sciences/geography/topographic-information/free-data-geogratis/download-directory-documentation/17215 Accessed: January, 2017

Powter, C.B. 2002. Glossary of Reclamation and Remediation Terms used in Alberta, 7th Edition. Alberta Environment. Report #: SSB/LM/02-1 Available at: https://extranet.gov.ab.ca/env/infocentre/info/library/6843.pdf Accessed: January, 2017

Saskatchewan Conservation Data Centre (SKCDC). 2015a. Tracked Taxa List: Vertebrates. Last updated: September 14, 2015. Available at: http://www.biodiversity.sk.ca/SppList/vertstrack.pdf. Accessed: January 2017.

SKCDC. 2015b. Tracked Taxa List: Invertebrates. Last updated: September 14, 2015. Available at: http://www.biodiversity.sk.ca/SppList/inverttrack.pdf. Accessed: January 2017.

SKCDC. 2016. SKCDC Training Manual and Data Sharing Agreement. Saskatchewan Conservation Data Centre, Fish and Wildlife Branch. Last updated: July 2016. Available at: http://www.biodiversity.sk.ca/Docs/SKCDCWildlife-manual.PDF. Accessed: January 2017.

Saskatchewan Land Resource Unit. 2009. SKSIDv4, Digital Soil Resource Information for Agricultural Saskatchewan, 1:100,000 Scale. Agriculture and Agri-Food Canada, Saskatoon, Saskatchewan.

Saskatchewan Ministry of Economy. 2017. Oil and Gas InfoMap. Available at: http://www.infomaps.gov.sk.ca/website/SIR_Oil_And_Gas_Wells/viewer.htm. Accessed: January 2017.

Saskatchewan Ministry of Environment (SKMOE). 2013. *Wild Species at Risk listed under* The Wildlife Act. Available at: http://www.environment.gov.sk.ca/Default.aspx?DN=c2e39ae8-cbf1-4f07-8d9a-b50ce3f4fd01. Accessed: January 2017.

SKMOE. 2014a. *Guidelines for the Preparation of the Terms of Reference.* Available at: http://www.publications.gov.sk.ca/details.cfm?p=78869. Accessed: January 2017.

SKMOE. 2014b. *Technical Proposal Guidelines.* Available at: http://www.publications.gov.sk.ca/details.cfm?p=78867. Accessed: January 2017.

SKMOE. 2015. *Saskatchewan Activity Restriction Guidelines for Sensitive Species*. Available at: http://publications.gov.sk.ca/documents/66/92181-Saskatchewan%20Activity%20Restriction%20Guidelines%20for%20Sensitive%20Species%20-%20September%202015-1.pdf. Accessed: January 2017.

SKMOE. 2016. *Wildlife Siting Guidelines for Saskatchewan Wind Energy Projects.* Available at: http://publications.gov.sk.ca/documents/66/94283-Wind%20Siting%20Guide%20September%2028.pdf. Accessed: January 2017.

Statistics Canada. 2016. 2011 Census of Population Program online database. Available at: https://www12.statcan.gc.ca/census-recensement/index-eng.cfm. Accessed: January 2017.

Stewart, R.E. and H.A. Kantrud. 1971. Classification of Natural Ponds and Lakes in the Glaciated Prairie Region. Resource Publication 92, Bureau of Sport Fisheries and Wildlife, U.S. Fish and Wildlife Service, Washington, D.C. Jamestown, ND: Northern Prairie Wildlife Research Center Online. Available at: http://www.npwrc.usgs.gov/resource/wetlands/pondlake/index.htm (Version 16APR1998). Accessed: January 2017.

Water Security Agency. 2017. Water Wells Information Database. Online tool available at: https://gis.wsask.ca/html5A/Index.html Accessed: January, 2017

Zimmerling, J.R., and C.M. Francis. 2016. Bat mortality due to wind turbines in Canada. The Journal of Wildlife Management 80: 1360-1369

Zimmerling, J.R., A.C. Pomeroy, M.V. d'Entremont and C.M. Francis. 2013. Canadian estimate of bird mortality due to collisions and direct habitat loss associated with wind turbine developments. Avian Conservation and Ecology 8: 10.

Appendix A ENVIRONMENTAL ASSESSMENT TERMS OF REFERENCE

Blue Hill Wind Energy Project
Terms of Reference

Prepared for:
Algonquin Power
354 Davis Road
Oakville, ON L6J 2X1

Prepared by:
Stantec Consulting Ltd.
100-75 24th Street East
Saskatoon, SK S7K 0K3

February 6, 2017

Sign-off Sheet

This document entitled Blue Hill Wind Energy Project Terms of Reference was prepared by Stantec Consulting Ltd. ("Stantec") for the account of Algonquin Power (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by Chantal Eidem
(signature)

Chantal Eidem, M.Sc.

Reviewed by
(signature)

Neil Cory, M.E.Des.

Reviewed by
(signature)

George Hegmann, M.E.Des, P.Eng.

Table of Contents

LIST OF TABLES

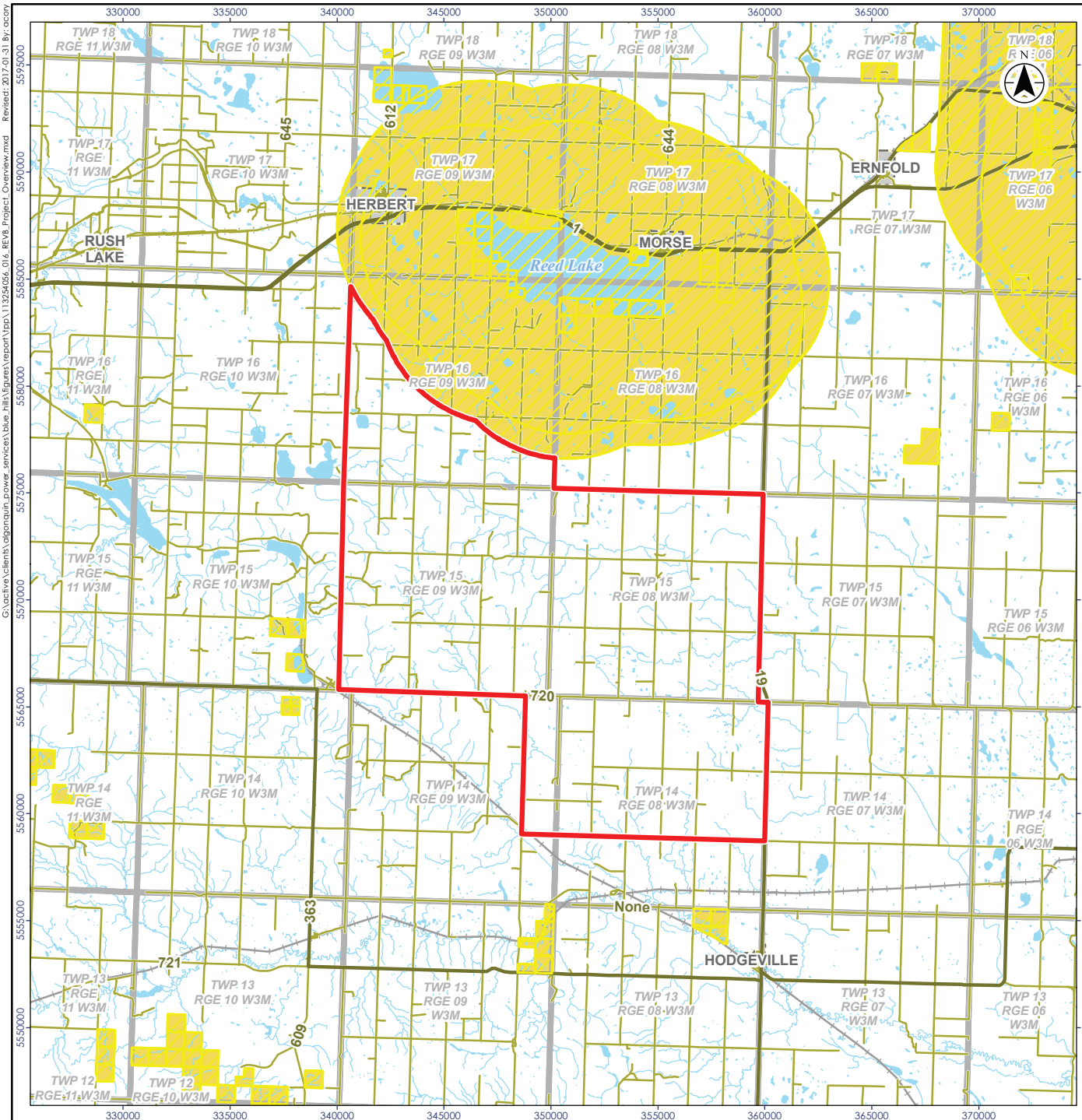
LIST OF FIGURES

Abbreviations

EA	Environmental Assessment
EIS	Environmental Impact Statement
GIS	Geographic Information System
HCB	Heritage Conservation Branch
HRIA	Heritage Resources Impact Assessment
km	kilometre
LAA	Local Assessment Area
MW	megawatt
NAD	North American Datum
NGO	Non-Governmental Organization
PDA	Project Development Area
RAA	Regional Assessment Area
RM	rural municipality
SK	Saskatchewan
SKMOE	Saskatchewan Ministry of Environment
SOMC	species of management concern
TOR	Terms of Reference
VC	valued component
WTG	wind turbine generator

1.0 INTRODUCTION

Algonquin Power (Algonquin) is proposing to construct the Blue Hill Wind Energy Project (the Project), a 177 MW facility located in southern Saskatchewan (Figure 1-1). Algonquin has chosen to "opt in" to the formal environmental assessment (EA) process (i.e., self-declare that the Project is a 'development' under the Saskatchewan *Environmental Assessment Act*) and forgo a Ministerial Determination for the Project. These terms of reference (TOR) are intended to guide the preparation of the Environmental Impact Statement (EIS) in accordance with the Saskatchewan *Environmental Assessment Act* and have been prepared in consideration of the Saskatchewan Ministry of Environment's (SKMOE) *Guidelines for the Preparation of the Terms of Reference* (SKMOE 2014a).



Project Area
Wind Turbine Avoidance Zone
Major Road
Minor Road
Railway
Watercourse
Waterbody
Town/City
Township

0 2 4 Kilometers
1:275,000 (at original document size of 8.5x11)

Notes
1. Coordinate System: NAD 1983 UTM Zone 13N
2. Base features produced under license from the Government of Saskatchewan.

Stantec

Algonquin Power Co.

Project Location
Near Morse, SK

113254056-016 REVB
Prepared by acory on 2017-01-31
Technical Review by ceidem on 2017-01-31

Client/Project
Algonquin Power Co.
Blue Hills Wind Energy Project

Figure No.
1-1

Title
Project Overview

G:\active\client\algonquin_power_services\blue_hills\figures\report\ppt\113254056_016_REVB_Project_Overview.mxd Revised: 2017-01-31 By: acory

2.0 PROJECT OVERVIEW

The Project is located approximately 7 km south of Herbert, SK, and will consist of approximately 42 to 88 wind turbine generators (WTGs) (depending on the selected turbine type) and associated infrastructure, including access roads and electrical collector lines. Each WTG will have a capacity between 2.0 and 4.2 MW; the final WTG selection will be influenced by several factors, including specific parameters of the local wind regime and economic (market and debt-financing) considerations at the time of procurement. The Project Area encompasses 470 quarter sections; however, only approximately 42 to 110 quarter sections are expected to be used for the Project layout. This estimate of quarter sections and the number of WTGs may change as the Project layout is refined and finalized. It should be noted that the Project will not disturb entire quarter sections; only small amounts of land within each quarter section will be used to accommodate Project infrastructure such as WTGs, access roads and collector lines. Construction of the Project is anticipated to begin in 2019 and commissioned in 2020.

2.1 PROJECT DESCRIPTION

A detailed description of the proposed Project will be provided in the EIS. The Project description will describe components of the Project phases, including construction, operation and maintenance, and decommissioning.

The Project description will:

- Provide a profile of the Proponent, name of the legal entity, contact person and mailing address.
- Identify the Project location and provide maps that identify the Project's spatial boundaries (see Section 2.2) in relation to nearby communities, as well as other past, present or reasonably foreseeable future projects.
- Provide appropriately-scaled maps and/or figures of the Project components and activities. A GIS shapefile, in NAD 1983 datum Zone 13 of the Project's spatial boundaries will be included with the digital submission.
- Describe on-site components, associated on-site and off-site infrastructure and other facilities associated with the proposed Project. This will include, but not be limited to:
    - Temporary work spaces
    - Access management
    - Wastewater management
    - Waste management
    - Environmental management framework

- Describe activities associated with the construction, operation, and decommissioning phases of the proposed Project.
- Describe the capital construction phase and the predicted duration of the Project.
- Describe the benefits of the Project, including jobs created, local training employment and business opportunities.

2.2 PROJECT BOUNDARIES

2.2.1 Spatial Boundaries

The spatial boundaries will reflect the geographic extent over which the Project's environmental effects may occur. In some cases, these boundaries will likely vary for each valued component (VC) and, as such, preliminary VC-specific spatial boundaries are defined in Sections 4.2 to 4.8. Spatial boundaries for the EIS include the following:

- **Project Development Area (PDA)** encompasses the Project footprint and is the anticipated area of physical disturbance associated with the construction and operation of the Project.
- **Local Assessment Area (LAA)** is the area in which both: a) project-related environmental effects (direct or indirect) can be predicted or measured with a level of confidence that allows for assessment; and b) there is a reasonable expectation that those potential effects in the LAA will be a concern. The LAA encompasses the PDA and is VC specific.
- **Regional Assessment Area (RAA)** is the area that establishes the context for determining significance of project-specific effects. It is also the area within which potential cumulative effects – the residual effects from the Project in combination with those of past, present and reasonably foreseeable project - are assessed. The RAA encompasses the PDA and LAA.

2.2.2 Temporal Boundaries

Temporal boundaries identify when an environmental effect is evaluated in relation to specific project phases and activities. The temporal boundaries will be based on the timing and duration of project activities and the nature of the interactions with each VC. The temporal boundaries of the Project will include construction, operation and maintenance, and decommissioning, and will be defined in the EIS.

2.3 PROJECT ALTERNATIVES

Technically and economically feasible alternatives for carrying out the Project will be described and considered in the EIS. In accordance with SKMOE's TOR guidelines (SKMOE 2014a), this description will include a brief description of the alternatives, key issues for consideration, analysis

of the alternatives that are technically and economically feasible, and justification of the selection of the preferred alternative.

2.4 ANCILLARY PROJECTS

The EIS will provide a general description of ancillary projects associated with this Project, including timelines and identifying any major environmental and socio-economic implications. If known, the location of ancillary projects will be presented at an appropriate scale.

2.5 REGULATORY REQUIREMENTS

Algonquin's decision to opt-in to Saskatchewan's EA process means that the Project will be subject to an EA under Saskatchewan's *Environmental Assessment Act*. The Project is not anticipated to require federal assessment (i.e., subject to the *Canadian Environmental Assessment Act, 2012*).

The EIS will describe the regulatory framework for the Project, including government policies, relevant land use plans and zoning, and the key legislation, standards or guidelines that provide the basis for the EA of the Project. The EIS will also provide a listing of the known required provincial and federal approvals, permits, licenses, letters of approval, and authorizations for all phases of the Project should EA approval be provided for the Project to proceed.

3.0 INDIGENOUS, PUBLIC AND REGULATORY ENGAGEMENT

In the EIS, Algonquin will provide a summary of the engagement undertaken with First Nation and Métis communities, interested parties, and regulators. This summary will include issues, questions and concerns raised, and how these issues and concerns were addressed through design of the Project. This section of the TOR also provides a summary of engagement activities completed to date.

3.1 OVERALL OBJECTIVES

The objectives of the Indigenous and public engagement program planned for this Project are to:

- Provide the public, stakeholders, Indigenous communities, and other interested parties with timely and accurate information to facilitate a clear understanding of the Project;
- Gather and document issues, questions and concerns regarding the Project from interested parties;
- Gather input from interested parties on the scoping of issues to be included in the EIS;
- Gather information on traditional land use within the Project Area by Aboriginal peoples; and
- Inform the public, stakeholders, Aboriginal communities, and other interested parties on how public input informed planning, design, and mitigation decisions.

Algonquin will consider comments from the program in the preparation of the EIS.

The Indigenous and public engagement undertaken to date and summarized in the EIS may be able to support government efforts to satisfy Crown obligations for public and Aboriginal consultation and, where necessary, accommodation.

3.2 INDIGENOUS ENGAGEMENT

Efforts to engage with Indigenous communities have been, and will continue to be, undertaken as part of the EA for the Project. The objectives of this engagement program are in accordance with SKMOE's *Proponents Guide - Consultation with First Nations and Métis in Saskatchewan Environmental Impact Assessment* (SKMOE 2014b).

The objectives of the Indigenous engagement program are:

- To inform First Nations and Métis communities of the nature of the proposed Project and any potential environmental impacts, including short and long term plans;

- To identify and discuss potential adverse effects of the Project on First Nations and Métis' ability to exercise their right to hunt, fish, and trap for food and carry out traditional uses;
- To provide opportunities for communities to ask questions and voice concerns;
- To provide feedback on how concerns were addressed as part of the EIS;
- To allow the Project to benefit, during design and planning, from access to first-hand knowledge of the environment surrounding the Project; and
- To help determine which aspects of the environment should be addressed as part of the EIS.

Additionally, the Indigenous engagement program for the Project will help Algonquin to identify the current use of land and resources by Indigenous persons for traditional purposes that could be affected by the Project. Engagement will also be conducted with the goal of documenting any asserted or established Treaty Rights in support of the Crown's Duty to Consult (in any such scenario, this documented information would be forwarded by Algonquin or Stantec to the Province to address, because [consistent with federal case law] only the Crown can address assertions of impact on Treaty Rights or Entitlements).

3.2.1 Identification of Potentially Affected Indigenous Communities

A preliminary contact list of potentially affected Indigenous communities was compiled based on the following parameters:

- All First Nations located within 100 km of the Project
- All Métis Locals within 100 km of the Project

The goal is to begin with this preliminary list and expand as needed, based on the results of initial engagement.

3.2.2 Approach to Indigenous Engagement

Indigenous engagement activities will include providing information and meeting with potentially impacted First Nations and Métis communities' leadership. First Nation and Métis community leadership and membership were invited to public open houses held in January 2017, and will be invited to additional public open houses to be held in spring 2017 and summer 2017. If requested by community leadership, additional engagement activities may be used for individual Indigenous communities. The Indigenous engagement program also includes listening, documenting, responding and following up on comments and concerns raised by the communities regarding the Project.

3.3 PUBLIC AND REGULATORY ENGAGEMENT

3.3.1 Stakeholder Identification

A preliminary contact list of potentially interested parties was compiled based on the following parameters:

- All Rural Municipalities (RMs) within 20 km of the Project
- Individual neighbours (landowners, businesses, etc.) within 40 km of the Project
- All Villages, Towns, and Hamlets within 40 km of the Project
- All Cities within 100 km of the Project
- Non-Governmental Organizations (NGOs)
- Government Ministries and Organizations

The goal is to begin with this preliminary list and expand as needed, based on the results of initial engagement. Potentially interested parties may include landowners, community associations, municipal governments, regional planning agencies, related ministries, businesses, and special interest groups.

3.3.2 Engagement Methods

In-Person Meetings

Introductory in-person meetings have been and continue to be arranged with participating landowners, interested NGOs, municipal leadership, and government ministries and organizations. Initial phone calls were made to identified NGOs in January 2017 to introduce the Project, arrange in-person meetings and confirm interest. In-person meetings held with NGOs to date are summarized in Table 1.

Table 1 Summary of In-Person Meetings with NGOs to Date

Interested Party	Date	Location	Meeting Summary
Saskatchewan Environmental Society	January 25, 2017	320 James T. North, Lumsden, SK	Introduction of project, discuss process, reviewed project area and recorded comments
Nature Saskatchewan	January 23, 2017	206-1860 Lorne Street, Regina	Introduction of project, discuss process, reviewed project area and recorded comments
Public Pastures – Public Interest	January 25, 2017	320 James T. North, Lumsden, SK	Introduction of project, discuss process, reviewed project area and recorded comments
Chaplin Nature Centre	January 25, 2017	Elkhorn, SK	Introduction of project, discuss process, reviewed project area and recorded comments
Ducks Unlimited	January 23, 2017	1030 Winnipeg Street, Regina	Introduction of project, discuss process, reviewed project area and recorded comments
Saskatchewan Wildlife Federation	January 24, 2017	9 Lancaster, Moose Jaw	Introduction of project, discuss process, reviewed project area and recorded comments
Nature Conservancy	January 24, 2017	1777 Victoria Avenue, Regina	Introduction of project, discuss process, reviewed project area and recorded comments

Open Houses

The first round of open houses was held on January 23rd in Hodgeville, SK and on January 24th in Herbert, SK to initiate conversations with potentially interested members of the public, the First Nation and Métis Community and NGOs. The open houses were advertised in local newspapers, the Herbert Herald and Swift Current Prairie Post, posted at local RM offices, community centres, grocery stores and community bulletin boards. Invitations were distributed to residents of the RMs of Lawtonia, Coulee, Excelsior and Morse via Canada Post Neighbourhood Mail, and identified NGOs, and potentially affected Indigenous communities via email. The open houses provided opportunities for the public to learn about preliminary Project information regarding project planning and development activities and to meet the Algonquin project team. The same information was presented at both open houses, in different locations for the convenience of interested parties.

Attendance sign-in sheets were used to track the level of attendance at each open house. Feedback mechanisms such as questionnaires were used to receive feedback and provide opportunity for follow-up. During the open houses, a contact list of interested parties that wish to be notified directly by the SKMOE for the formal 30-day public review period was compiled.

Additional open houses are planned for spring and summer 2017.

Information Materials and Sources

Additional information will be mailed out, which will include a Project description, map of the Project Area, and general timelines of Project and regulatory activities.

Project information was made available on the Project website (https://bluehillswindproject.com/) and feedback could be directed to a Project-specific email address (BlueHills.WindProject@algonquinpower.com). The website provides updates on upcoming Project events and milestones, including engagement events and opportunities for formal public comment to regulatory agencies.

Tracking and Documentation

Contact information of interested parties is maintained in a database that is updated regularly and as required. Issues, concerns, comments, and questions have been, and will continue to be, logged in an engagement database for further consideration and/or action, where appropriate. The results of the public engagement program will be fully documented in the EIS, including any potential issues or concerns raised and the measures taken to address those issues or concerns. Attendance at open houses and interested parties wishing to be notified directly by SKMOE of the formal 30-day review period will also be recorded.

4.0 ENVIRONMENTAL ASSESSMENT

The methods that will be used to conduct the EA of the Project are outlined in this section. This approach is consistent with the requirements of the provincial EA process. These methods are based on a structured approach that:

- Follows an integrated approach to the assessment of Project-related and cumulative environmental effects;
- Focuses on issues of greatest concern;
- Considers applicable federal and provincial regulatory requirements for the assessment of environmental effects, with specific consideration of the requirements of the SKMOE and the scope of the EA as defined by the TOR;
- Considers issues raised by the public, Indigenous persons, and other stakeholders during consultation and engagement activities conducted; and
- Integrates engineering design and programs for mitigation and monitoring into a comprehensive environmental planning and management process.

4.1 OVERVIEW OF APPROACH

The EA methods to be used in preparation of the EIS will address both Project-specific and cumulative environmental effects. Project-specific environmental effects are changes to the biophysical or human environment that will be caused by a project or activity arising solely as a result of the proposed principal works and activities associated with the Project. Cumulative environmental effects are residual changes to the biophysical or human environment that are caused by an action associated with the Project, in combination with other past, present or reasonably foreseeable future projects or activities in the RAA. The environmental effects of past and present projects will be assessed through the establishment of current baseline conditions that reflect those cumulative environmental effects, in consideration of the addition of the Project and other future projects and activities.

The environmental effects of the Project will be assessed in the EIS for a range of VCs that are elements of the biophysical, social, cultural, and economic environments that have a legal, scientific, cultural, economic or aesthetic value on which the assessment should focus. VCs are selected in consideration of the susceptibility to change as a consequence of the Project and as a result of cumulative environmental effects. The benefits of the Project will also be identified and considered in this process.

Project-specific environmental effects and cumulative environmental effects will be assessed in the EIS using a standardized methodological framework for each VC, with standard tables and matrices used to facilitate and document details of the evaluation. The residual Project-related environmental effects (i.e., after mitigation has been applied) will be characterized using

specific criteria (e.g., direction, magnitude, geographic extent, duration, frequency, and reversibility) that are specifically defined for each VC. The significance of the Project-related environmental effects will then be determined based on pre-defined criteria or thresholds (also called significance criteria).

If there is substantive spatial and/or temporal overlap between the Project environmental effects and the environmental effects of other projects or activities that have been or will be carried out, cumulative environmental effects of the Project in combination with those other projects or activities will be assessed in the EIS to determine if the cumulative environmental effects could be significant, and to consider the contribution of the Project to them.

The environmental effects assessment approach to be used in the EIS is shown graphically in Figure 4-1. The EA methodology involves the following generalized steps.

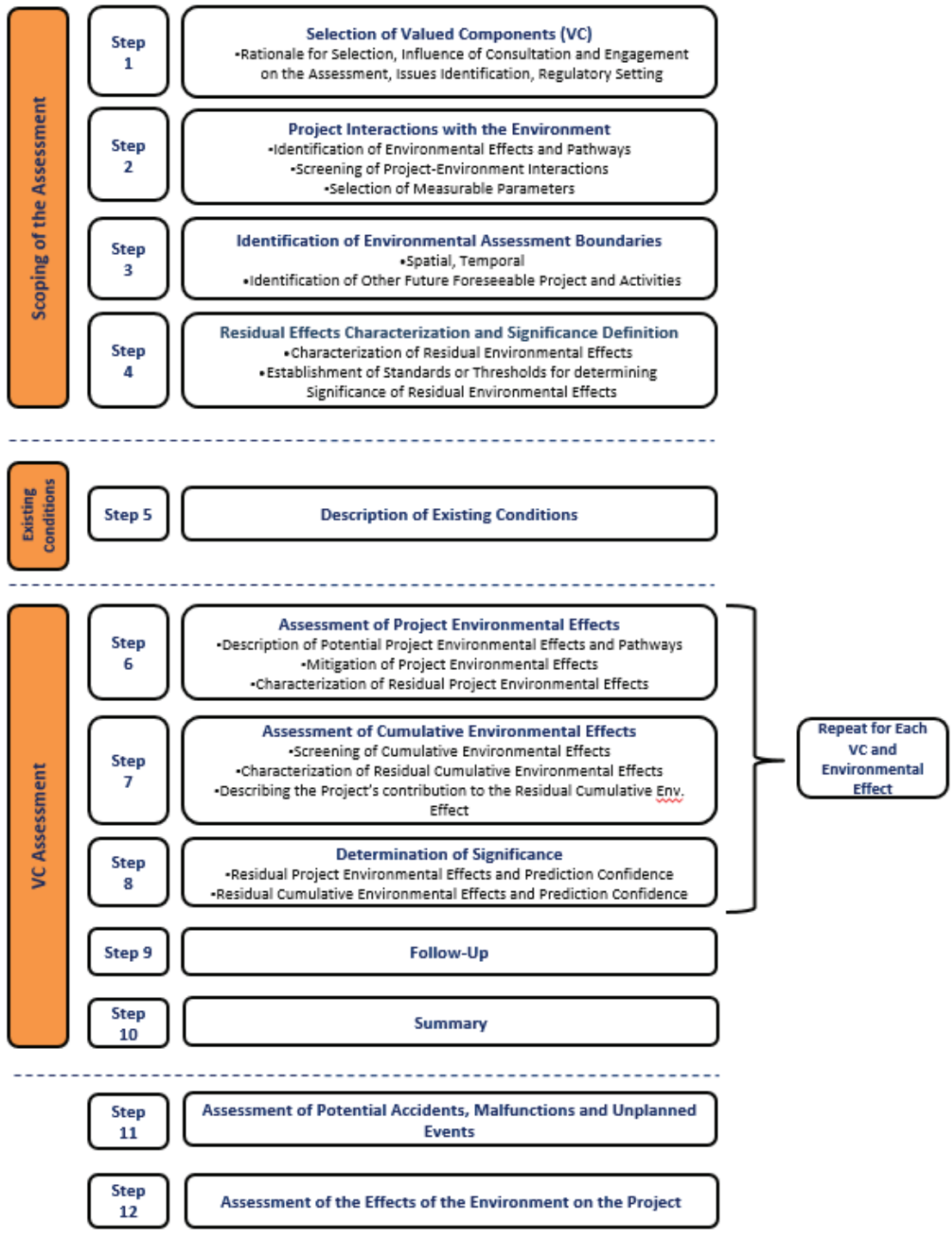


Figure 4-1 EA Methodology Flow Chart

4.1.1 Scoping of the Assessment

This step relies upon the scoping undertaken by regulatory authorities, consideration of the input of the public, stakeholders, and Indigenous people (as applicable), and the professional judgment of the Project team. The TOR reflect consideration of the outcome of all of those scoping activities, including the results of engagement, and establish the following approach to be taken and information to be considered and presented in the EIS:

- Selection of VCs and provision of the rationale for their selection
- Consideration of the influence of engagement on the scoping of the VC
- Identification of the VC-specific environmental effect(s) to be assessed
- Description of measurable parameters selected to facilitate appropriate quantitative or qualitative measurement of potential Project environmental effects and cumulative environmental effects (the degree of change in these measurable parameters will be used to help characterize environmental effects and evaluate their significance)
- Description of temporal, spatial, administrative, and technical boundaries
- Identification of the standards or thresholds proposed to determine the significance of environmental effects

Spatial boundaries for the assessment consist of the PDA, and for each VC, the LAA and RAA, which are selected to support the assessment of Project and cumulative environmental effects, respectively. These boundaries are selected taking into account the geographic and temporal range of the anticipated environmental effects of the Project, and ecological, technical and social considerations. The EIS will include appropriately-scaled maps and/or drawings of the assessment areas.

4.1.2 Existing Conditions

Baseline environmental conditions will be established for each VC. In many cases, existing conditions expressly or implicitly include those environmental effects that may be or may have been caused by other past or present projects or activities that have been or are being carried out. In focusing on VCs, the description of existing conditions is at a level of detail and scope that supports the assessment of environmental effects. Information is derived from existing available sources, and field study and reconnaissance or analysis conducted in support of this EA. In addition, the existing conditions for the biophysical and socio-cultural and economic environment will be provided at a high level to provide an overview of the setting for the Project, and to support an understanding of the receiving environment. The description will be sufficient to enable an understanding of how the current environmental conditions might be affected by the Project. As appropriate, the baseline data will allow for understanding of trends and changing conditions in the environment. Baseline information will be limited to that which is necessary to assess the environmental effects of the Project and support recommendations for mitigation, monitoring and follow-up.

4.1.3 Assessment

An assessment of Project-related environmental effects, and any overlapping cumulative environmental effects, will be made. A determination of significance will then be made in consideration of the identified significance criteria. These are further described below. Additional details on these EA methods will also be provided in the EIS.

4.1.3.1 Assessment of Project-Specific Environmental Effects

Environmental effects of the Project will be identified and assessed. For each potential effect, the physical activities of the Project that might interact with the VC and result in an environmental effect will be identified in a matrix table by a check mark. These interactions will be discussed in detail in subsequent sections of the EIS, in the context of effects pathways, standard and Project-specific mitigation/enhancement, and residual effects. A justification for no effect will be provided following the table.

4.1.3.2 Assessment of Cumulative Environmental Effects

Cumulative environmental effects of the Project will be identified in the EIS for all phases of the Project, taking into consideration other projects or activities that have been or will be carried out (as reflected in baseline conditions and for reasonably foreseeable projects or activities). An assessment of potential interactions will be completed to determine if an assessment of cumulative environmental effects is required (i.e., there is potential for substantive interaction) for those specific Project-related residual environmental effects that overlap with residual environmental effects of other projects or activities that have been or will be carried out in the RAA. The residual cumulative environmental effects of the Project in combination with other projects or activities that have been or will be carried out will be evaluated, including the contribution of the Project to those cumulative environmental effects, and with consideration for any additional mitigation that may be required for the Project or implemented by others.

4.1.3.3 Determination of Significance

The significance of residual Project-related environmental effects and residual cumulative environmental effects will then be determined, based on significance criteria defined for each VC in these TOR.

4.1.3.4 Monitoring

Monitoring measures that are required to confirm compliance with regulatory requirements, to verify the environmental effects predictions or to assess the effectiveness of the planned mitigation will be described in the EIS, where applicable. Monitoring commitments will be addressed in the commitments register (see Section 6.1).

4.1.4 Selection of Valued Components

VCs are important aspects of the ecological and socio-economic environments that are considered to be important from public, Indigenous, and/or scientific and technical perspectives. VCs are identified to focus the EA on those aspects of the environment that are valued and most likely to be affected by the Project and cumulative environmental effects.

The selection of VCs is influenced by a number of factors, including:

- Consultation with regulators that will help to identify issues of greatest concern to them (e.g., species of management concern [SOMC], sensitive wildlife habitat features)
- Indigenous and public concerns that will be identified during the implementation of a comprehensive engagement plan as described in Section 3
- An understanding of potential Project-environment interactions and potential environmental effects through the experience of Algonquin, as a major developer of renewable power, and Stantec, who has an extensive history with understanding and describing these interactions
- An understanding of the sensitivity of the environmental aspects to disturbances typical of this type of Project
- Experience with the design and implementation of practical mitigation measures by the Project team

In consideration of this, the EA will focus on seven VCs, reflecting the anticipated Project-environment interactions, and based upon an understanding of the biophysical and socio-economic environments associated with this Project. The scoping and description of VCs will consider parameters (e.g., direction, magnitude, geographical extent, duration, frequency, reversibility, and context) in contextualizing the potential environmental effects. Proactive mitigation planning will focus on these parameters.

The SKMOE guidelines for TOR (SKMOE 2014a) suggest a number of candidate VCs for consideration. These TOR reflect consideration of those suggestions and are encapsulated in one form or another within the selected VCs.

The biophysical and socio-economic VCs to be considered in the EIS are:

- Acoustic Environment
- Vegetation and Wetlands
- Wildlife and Wildlife Habitat
- Heritage Resources
- Land and Resource Use

- Employment and Economy
- Community Services and Infrastructure

During the selection process, the following eight VCs were considered as candidate VCs but it was concluded that either the potential environmental effects on these components would be negligible and immeasurable and could be addressed with standard mitigation measures, or they will be addressed through the consideration of particular interactions with other VCs.

- Air Quality – The implementation of industry best practices and standard mitigation measures during construction will reduce the degree to which air quality is affected by the Project. As such, a change in air quality is expected to be negligible and Air Quality is not considered a VC for this Project.
- Geology – Foundations for each WTG are not expected to adversely affect the geology of the Project Area. The foundation design (i.e., dimensions, depth and type) will be based on a geotechnical evaluation of the site and construction of a foundation will incorporate industry best practices and standard mitigation measures.
- Terrain and Soils – With the implementation of industry best practices and standard mitigation measures (e.g., redistributing soils on the landscape, avoiding steep slopes), the potential for a change in terrain or soil loss is expected to be low or negligible. Therefore, Terrain and Soils is not considered a VC for this Project. Changes to terrain and soils as it relates to agricultural practices will be considered in the Land and Resource Use VC.
- Groundwater – Excavation and dewatering (if necessary) are not expected to adversely affect groundwater flows, recharge function or the quantity/quality of local water supply wells with the use of standard mitigation techniques. Given the shallow depth (i.e., approximately 2 to 3 m) and highly localized disturbance of foundation construction, alteration of groundwater flows is unlikely. Groundwater flows are expected to reestablish themselves post-construction. Additionally, groundwater recharge is not expected to be affected given the very small proportion of the Project area that will be developed as impervious surfaces (e.g., access roads and WTGs.). Groundwater as it relates to wetlands is considered in the Vegetation and Wetland VC.
- Surface Water – This VC relates to surface water (including streams, rivers, lakes, reservoirs) that may be used for human consumption (e.g., source of fire-protection water, potable water, etc.). There are no major rivers or lakes located within the Project Area and, with the implementation of standard mitigation measures, the Project is not expected to have an effect on the water quality and quantity of the few streams located within the Project Area. As such, Surface Water is not considered a VC for this Project. Surface water, as it relates to the biophysical environment, is considered through the Vegetation and Wetlands, and Wildlife and Wildlife Habitat VCs.

- Aquatic Environment – There are no fisheries resources, as defined in the *Fisheries Act*, in the PDA and no Project effects on fish and fish habitat are expected. As such, the Aquatic Environment is not considered a VC for this Project.
- Biodiversity – Biodiversity is inherently considered in relation to the Vegetation and Wetlands, and Wildlife and Wildlife Habitat VCs. These VCs include an understanding of the number and type of species present and the range of habitats presents, whether they are common species or habitats or SOMC. As such, efforts made to reduce effects of the Project on Vegetation and Wetlands and Wildlife and Wildlife Habitat will also support efforts to conserve biodiversity.
- Human Health and Safety – This component is considered through other VCs such as Acoustic Environment and Community Services and Infrastructure.

The following sections describe each of the VCs selected, as well as the potential Project-VC interactions, VC-specific spatial boundaries, proposed criteria for the evaluation of the significance of environmental effects, existing conditions (baseline information) and the approach to the assessment of environmental effects.

4.1 ACOUSTIC ENVIRONMENT

For the purpose of the EIS, the Acoustic Environment refers to the environmental sound perceived by humans in the environment. It does not include acoustic energy perceived by wildlife as this is assessed within the Wildlife and Wildlife Habitat VC under sensory disturbance.

The Acoustic Environment will be included as a VC in the EIS as the Project activities and infrastructure have the potential to cause environmental sound (i.e., noise). Specifically, unwanted sound from Project activities may adversely affect the existing acoustic environment resulting in community annoyance.

4.1.1 Spatial Boundaries

- PDA: see definition in Section 2.2.1.
- Noise Assessment Area: includes the PDA and an area 3 km beyond the PDA boundary.

4.1.2 Significance Criteria

The government of Saskatchewan does not have regulatory guidelines for acceptable ambient noise levels for wind energy projects. As such, the proponent will utilize the Ontario noise guideline of 40 dBA sound level limit to determine significant adverse effect thresholds for noise within the Project's spatial boundaries.

4.1.3 Existing Conditions

Within the PDA, there are approximately 29 residences (i.e., potential noise receptors) within the Project Area based on RM maps and a field assessment conducted in the summer of 2016. Noise receptors will be re-verified once a Project layout has been determined and prior to a noise assessment being completed. There are currently no commercial facilities within the Project Area. The acoustic environment would be similar to natural conditions for a prairie landscape. Existing sources of periodic or irregularly occurring noises in the Project Area include:

- Natural environment (i.e., wind, rain, insects, wildlife);
- Aircraft flyover;
- Residential activities;
- Residential and commercial vehicle traffic; and
- Agricultural machinery and farming activities.

4.1.4 Environmental Effects Analyses

The Acoustic Environment effect assessment focuses on the Project noise effect during the operation phase. The Project operation noise emissions (i.e., wind turbine and substation) can be characterized by sound power data provided by the manufacturer. The noise effect within the Noise Assessment Area will be quantified by noise modelling. Noise effects during the construction phase will be assessed qualitatively.

The baseline case, modelling results, and applicable noise limits will be used to determine the significance of adverse residual Project effects and cumulative effects on the Acoustic Environment using the significance criteria identified in Section 4.1.2. Mitigation measures to reduce or avoid Project effects will be considered, if required, in the event of a determination of significance.

4.2 VEGETATION AND WETLANDS

For the purposes of the EA, vegetation and wetlands are defined as the land cover types occurring within the spatial boundaries of the Project, and the individual plant SOMC that are protected under legislation. The specific definitions of these land cover categories and SOMC will be provided in the EIS.

Vegetation and Wetlands will be included as a VC in the EA because of the potential for the Project to interact with plant SOMC and to affect natural land cover types in the Project Area. Native plants and their communities on the landscape have an inherent value, but also because of the importance of natural land cover types (e.g., native grassland and wetlands) as habitat for wildlife species on the landscape. Plant species, including rare and endangered

species as well as nuisance species, are managed under several pieces of federal and provincial legislation.

4.2.1 Spatial Boundaries

The spatial boundaries within which the assessment of effects of the Project on Vegetation and Wetlands will take place include:

- **PDA**: see definition in Section 2.2.1.
- **LAA**: includes the PDA and an area extending 300 m beyond the PDA boundary. This represents the maximum setback distance for high intensity construction project activities from plant SOMC that potentially occur near the Project (SKMOE 2015).
- **RAA**: includes the PDA and an area extending 10 km beyond the PDA boundary. This represents the areal extent where the Project effects may act cumulatively on Vegetation and Wetlands with other projects and activities on the landscape and the scale at which significance of effects are assessed.

4.2.2 Significance Criteria

The significance of Project effects on Vegetation and Wetlands will be determined using qualitative and appropriate quantitative approaches, through professional judgment and previous experience with effects of wind energy developments on Vegetation and Wetlands.

Criteria for the determination of significance include:

- Effects that threaten the long-term persistence or viability of a plant species (including species at risk [SAR] and SOMC) in the RAA, including effects that are contrary to or inconsistent with federal (including recovery strategies and critical habitat) and provincial management objectives.
- Effects that threaten the long-term persistence or viability of native vegetation types in the RAA, including effects that are contrary to or inconsistent with federal (including recovery strategies and critical habitat) and provincial management objectives.
- Effects that result in a permanent loss of wetlands that cannot be mitigated.

4.2.3 Existing Conditions

The majority (90.0%) of the Project Area consists of land that has either been developed (1.7%) or cultivated for either production of annual crops (70.4%) and perennial hay (4.8%), or seeded (tame) pasture (13.1%) for grazing. There are relatively small proportions of the Project Area in natural land cover types that include native grassland (7.8%) and water/wetlands (1.9%), with trace amounts of shrubland (0.1%) (Agriculture and Agri-Food Canada [AAFC] 2015). Most of the native grassland occur in the western and southern portions of the Project Area where the

topography is more variable and soil quality is lower. Wetlands are dispersed more throughout the eastern and northern portions of the Project Area.

Based on the current SKCDC database, there were no known occurrences of plant SOMC within the Project Area.

4.2.4 Environmental Effects Analyses

To assess the potential for significant adverse environmental effects of the Project on Vegetation and Wetlands, detailed information about existing conditions within the spatial boundaries defined in Section 4.3.1will be obtained.

Land cover composition within the PDA, LAA and RAA will be determined using available online digital information layers (e.g., AAFC 2015). As these information sources often underestimate the extent and distribution of wetlands on the landscape, wetlands will be delineated and classed using the Stewart and Kantrud (1971) classification system. Land cover and wetland metrics will be field-validated by qualified professional ecologists. Land cover distribution within the PDA and LAA will guide field surveys to identify the abundance and distribution of rare plants; rare plant surveys will follow appropriate SKMOE protocol.

Analyses used in the EIS to assess effects to vegetation and wetlands will focus on determining the extent of change in vegetation community (i.e., land cover types) diversity, the change in plant species diversity, and the change in wetland function. The objective of theses analyses will be to assess whether the Project will be likely to have a significant adverse residual effect on Vegetation and Wetlands based on significance criteria of Section 4.2.2. The determination of significance will consider mitigation measures proposed to reduce or avoid effects of the Project to Vegetation and Wetlands.

4.3 WILDLIFE AND WILDLIFE HABITAT

Wildlife and Wildlife Habitat will be included as a VC in the EA because of the potential of the Project to interact with wildlife and wildlife habitat resources. As well, these resources are recognized as having aesthetic, economic and recreational importance to Canadians (Filion et al. 1993). The importance of this VC is recognized through several pieces of federal and provincial legislation that protect both wildlife and components of their habitat across the landscape, including within the spatial boundaries of the Project.

Wildlife and Wildlife Habitat as a VC represents a broad range of wildlife species (i.e., birds, mammals, amphibians and reptiles, and invertebrates) and their habitats that are known to occur or have potential to occur in the Project Area. There are numerous species potentially found within the spatial boundaries of the Project, with most of these species being common and abundant (i.e., not a SAR). The scope of this assessment includes all wildlife species, but focuses on SOMC (includes SAR), and their habitat. Those SOMC included in the EIS will be defined therein, but generally include all federally and provincially-listed SAR, species listed by

the Committee on the Status of Endangered Wildlife in Canada, regionally imperiled species tracked by the province, and species with sensitive environmental features that have activity restriction setbacks.

Two potential effect pathways to Wildlife and Wildlife Habitat will be assessed in the EIS:

- Change in habitat
- Change in wildlife mortality risk

Each effects pathway has one or more mechanisms that will be identified and described in the EA, and for which measurable parameters will be defined.

4.3.1 Spatial Boundaries

The spatial boundaries within which the assessment of effects of the Project on Wildlife and Wildlife Habitat will take place include:

- **PDA**: see definition in Section 2.2.1.
- **LAA**: includes the PDA and an area extending 1 km beyond the PDA boundary. This represents the maximum setback distance for high intensity construction project activities from sensitive wildlife features that potentially occur near the Project (SKMOE 2015).
- **RAA**: includes the PDA and an area extending 10 km beyond the PDA boundary. This represents the areal extent where the Project effects may act cumulatively on Wildlife and Wildlife Habitat with other projects and activities on the landscape and the scale at which population level effects are assessed.

4.3.2 Significance Criteria

The significance of Project effects on Wildlife and Wildlife Habitat will be determined using qualitative and appropriate quantitative approaches, through professional judgment and previous experience with wildlife and their habitat from a wind energy development perspective.

A significant adverse residual environmental effect on the Wildlife and Wildlife Habitat VC and/or key indicators is defined as one that threatens the long-term persistence or viability of a wildlife species (including SAR and SOMC) in the RAA, including effects that are contrary to or inconsistent with federal (including recovery strategies and critical habitat) and provincial management objectives.

4.3.3 Existing Conditions

As the Project infrastructure layout has not yet been determined, the existing conditions of the Wildlife and Wildlife Habitat VC were characterized in the Technical Project Proposal for the entire Project Area using desktop analyses and through partial field validation of land cover.

The Project Area occurs in the Mixed Grassland ecoregion, which is a semiarid ecoregion found in southwestern Saskatchewan and southeastern Alberta and forms part of the Great Plains of North America. The Project Area also lies within the Missouri Coteau of the Prairie Pothole Region, which is characterized by numerous depressional wetlands that contribute substantially to the regional biodiversity (Environment Canada 2013). The Canadian portion of the Prairie Pothole Region is identified as Bird Conservation Region 11, which contains 341 species of birds within its 467,000 km^2 area. There are also an estimated 51 species of mammals and 15 reptiles and amphibians in the ecoregion (Acton et al. 1998).

The Project Area consists of a landscape composed mainly (75.2%) of land in cultivation and hay production, with small to medium patches of natural terrestrial land cover types (i.e., grassland, shrubland, deciduous forest) throughout the landscape. These natural land cover types are concentrated more to the south and west portions of the Project Area. There are minimal wetlands and some waterbodies dispersed in the Project Area, though concentrated in the north and east plateau regions.

Within the Project Area, there are no designated wildlife conservation lands or critical habitat identified for species listed under *SARA*, nor does the Project Area overlap any Terrestrial Wildlife Habitat Inventory areas. The Project Area does not overlap wind energy project avoidance zones (SKMOE 2016).

4.3.4 Environmental Effects Analyses

To assess the potential for significant adverse environmental effects of the Project on Wildlife and Wildlife Habitat, detailed information about existing conditions within the Wildlife and Wildlife Habitat spatial boundaries (Section 4.3.1) will be obtained.

Desktop analyses will be completed at the PDA, LAA and RAA extents using available digital resources. Detailed field studies will be completed at the PDA and LAA scales to identify potential sensitive wildlife features to guide revisions to the location of Project infrastructure, and to assess the extent of potential effect to Wildlife and Wildlife Habitat.

Based on existing conditions identified within the Project Area, field studies will possibly include:

- Raptor Nest Surveys
- Sharp-tailed Grouse Lek Surveys
- Nocturnal Acoustic Amphibian Surveys
- Breeding Bird Surveys
- Burrowing Owl Surveys
- Diurnal Bird Migration Movement Surveys (Spring and Fall)
- Short-eared Owl Surveys

- Common Nighthawk Surveys
- Acoustic Bat Activity Surveys (Spring and Fall)
- Yellow Rail Surveys

Other surveys (e.g., reptiles, mammals, invertebrates) are not deemed necessary because of the ability to mitigate potential effects on these species groups. Survey methods will follow published protocols or alternate methods approved by SKMOE, and will be conducted by qualified professional biologists. As the proposed Project infrastructure layout is refined, surveys may be eliminated if potential suitable wildlife habitat features are avoided in accordance with activity restriction setback guidelines (SKMOE 2015).

Analyses used in the EIS to assess effects to Wildlife and Wildlife Habitat will focus on determining the extent of changes in wildlife habitat, wildlife mortality risk and wildlife movement because of the Project at the scale of the LAA, and in combination with reasonably foreseeable future projects at the scale of the RAA. The objective of these analyses will be to determine if significant adverse residual effects have occurred using measurable parameters and significance criteria described in Section 4.3.2. Determinations of significance will consider proposed mitigation measures to reduce Project effects on Wildlife and Wildlife Habitat.

4.4 HERITAGE RESOURCES

Heritage Resources are defined for consideration in the EIS as the physical (tangible) remnants of past human activity that may be visible at the ground surface or buried by soil and sediment that, once identified, are administered by the Heritage Conservation Branch (HCB) under the Saskatchewan Ministry of Parks, Culture and Sport. Heritage property is managed pursuant to the Saskatchewan *Heritage Property Act* (1980) and are defined as:

- Archaeological objects (any object showing evidence of manufacture, alteration or use by humans);
- Palaeontological objects (a fossil of a vertebrate animal or a macroscopic fossil of an invertebrate animal or plan that lived in the geological past);
- Any property of interest for its architectural, historical, cultural, environmental, archaeological, palaeontological, aesthetic, or scientific value; and
- Any site where any archaeological, palaeontological or property of interest may reasonably be expected to be found.

These resources include artefacts (e.g., stone tools), features (e.g., stone circles or building ruins), altered landscapes (e.g., trails), and the remains of food, in the form of clusters of butchered animal bone or accumulations of discarded commercial packaging. Culturally significant spaces, such as ceremonial sites and medicinal plant gathering sites, as described by Aboriginal Elders, are also considered as Heritage Resources and can be administered under the Saskatchewan *Heritage Property Act* where appropriate. Although palaeontological resources

are administered under the *Heritage Property Act*, the surficial geology of the PDA (glacial till) is not a likely context for the preservation of fossil remains.

Heritage Resources will be included as a VC in the EIS because the Project will result in ground disturbance and may potentially have an adverse environmental effect on heritage resources.

4.4.1 Spatial Boundaries

- **PDA**: see definition in Section 2.2.1.
- **LAA**: the LAA will be the same as the PDA.
- **RAA**: the RAA will be the same as the PDA.

4.4.2 Significance Criteria

A significant adverse residual environmental effect on Heritage Resources will be defined as one that results in a permanent Project-related disturbance to, or destruction of, all or part of a Heritage Resource (including archaeological, paleontological and architectural resources of significance) considered by the HCB to be of major importance due to factors such as rarity, undisturbed condition, spiritual importance, or research importance, and that cannot be mitigated or compensated.

4.4.3 Existing Conditions

Within the Project Area boundary, there are four recorded heritage resources including two artefact/feature combinations, one artefact scatter and one possible burial (which is designated as a Site of Special Nature).

A total of 202 quarter sections were identified as heritage sensitive in the Project Area. These quarter sections were found mainly in the western portion of the Project Area where there is a greater abundance of non-cultivated lands.

4.4.4 Environmental Effects Analyses

To assess the potential for significant adverse environmental effects of the Project on Heritage Resources, detailed information about existing conditions within the Heritage Resources spatial boundaries (Section 4.4.1) will be obtained. This will be accomplished by submitting a heritage referral to HCB should Project infrastructure be proposed on heritage sensitive lands (identified through desktop screening using the Developer's Online Screening Tool). HCB will determine if a Heritage Resource Impact Assessment (HRIA) is required, based on the location of proposed Project infrastructure. An HRIA may identify previously undiscovered heritage resources.

Analyses used in the EIS to assess effects to Heritage Resources will focus on the results of the HRIA and the presence and number of heritage resources where Project infrastructure is being sited. The objective of these analyses will be to determine if significant adverse residual effects

have occurred using measurable parameters and significance criteria described in Section 4.4.2. Determinations of significance will consider proposed mitigation measures to reduce Project effects on Heritage Resources.

If an HRIA identifies previously undiscovered heritage resources, these would require mitigation measures approved by the HCB. The preferred mitigation measure of archaeological sites is always avoidance, with setback restrictions being developed in consultation with HCB. If an archaeological site is unavoidable, mitigation measures will be determined by HCB and may range from site sampling to full scale excavation.

4.5 LAND AND RESOURCE USE

Land and Resource Use as a VC consists of the occupation, and public and private use for commercial and recreational purposes, and the visual quality (e.g., obstructions and ambient light/shading) of the landscape. The Project activities and infrastructure construction and operation could result in changes on the landscape that affect land and resource use, and as such this environmental component will be included as a VC in the EIS.

4.5.1 Spatial Boundaries

The spatial boundaries within which effects of the Project on Land and Resource Use will be assessed include:

- **PDA**: see definition in Section 2.2.1.
- **LAA**: includes the PDA and an area extending 1 km beyond the PDA boundary.
- **RAA**: includes the PDA and an area extending 5 km beyond the PDA boundary.

4.5.2 Significance Criteria

A significant adverse residual effects of the Project on Land and Resource Use is defined as one where:

- The Project does not comply with established land use plans, policies or by-laws.
- The Project will create a change or disruption that restricts or degrades present land use capability to a point where the activities cannot continue at or near current levels and where compensation is not possible.

4.5.3 Existing Conditions

Land use within the Project Area is dominated by agricultural uses (88.3%) for annual crops, perennial crops, and livestock grazing. Native vegetation, water and wetlands, and developed lands make up the remaining Project Area lands.

There are no identified mineral resources in the Project Area (Saskatchewan Geological Survey 2016).

Within the Project Area there are six abandoned oil and gas wells, but no active wells or planned drilling activities (Saskatchewan Ministry of Economy 2017). There are also 94 groundwater wells (Water Security Agency 2017). Wells are likely used for domestic or agricultural purposes.

Recreational activities in the Project Area likely include hunting and nature viewing (e.g., bird watching).

The viewscape consists of a relatively uniform prairie landscape with limited trees or other vertical features to obstruct the view.

4.5.4 Environmental Effects Analyses

To assess potential effects of the Project on Land and Resource Use, baseline conditions in the spatial boundaries of the VC will be characterized using available online resources. Information obtained for the analyses of land cover types and the field-validation of land cover will be used to quantify land use in the Project Area.

Other current resource uses, such as aggregate pits, will be identified during field surveys in the PDA and LAA.

Analyses of information and potential effects of the Project on Land and Resource Use will consist of determining the potential for a significant adverse residual effect as defined in Section 4.5.2, after considering mitigation measures to reduce or avoid effects.

4.6 EMPLOYMENT AND ECONOMY

The Employment and Economy VC represents socio-economic components related to the labour, goods and services required for a project that may have beneficial or adverse effects on the local and provincial economy and employment rates.

The Project will require both labourers and goods and services during its three phases, and as such will have effects on the components of this VC. Therefore, Employment and Economy will be included as a VC in the EIS.

4.6.1 Spatial Boundaries

The spatial boundaries used to assess effects include:

- **LAA**: represents the extent of rural municipalities in which the Project is located, and adjacent communities from which goods and services may be obtained.

- **RAA**: includes the Province of Saskatchewan as a metric for employment and economic effects.

The PDA is not an appropriate scale to assess this VC due to its small and focused area; therefore, has not been included.

4.6.2 Significance Criteria

For the purposes of the EIS, a significant adverse effect of the Project on Employment and Economy will be determined using the following criteria:

- Those that are distinguishable from current conditions and trends; and cannot be managed or mitigated through adjustments to programs, policies, plans, or through other mitigation
- Local or municipal government revenue unable to cover their Project-related expenditures without raising taxes to other parties

4.6.3 Existing Conditions

The Project Area overlaps two RMs, Morse (No. 165) and Lawtonia (No. 135). The population of the RM of Morse, exclusive of towns, was 401 in 2011, which is a 7.8% reduction from the 2006 census count of 435. The RM of Lawtonia, however, saw a 22% population increase from 2006 (n = 356) to 2011 (n = 434) (Statistics Canada 2016).

There are no communities located within the identified Project Area, however, three towns or villages are located within 6 km of the Project Area and the nearest city is Swift Current, at approximately 36 km distance.

It is likely that 45 to 90 person-years of employment will be required for Project construction. There will also be approximately 8 to 10 full-time employees that will be filled locally and regionally. As there is a limited workforce available within the Project Area, new workers will likely be brought into the region, although local employees may be hired, on an as-required basis.

4.6.4 Environmental Effects Analyses

To assess the effects of the Project on Employment and Economy, baseline conditions within the spatial boundaries of the Project will be characterized using available online resources. Effects of the Project's predicted employment requirements and economic impacts will be evaluated by considering the following effects pathways:

- Change in regional labour force
- Change in regional business
- Change in municipal government finances

- Change in provincial economy

Significance of residual effects to Employment and Economy will be determined using the criteria outlined in Section 4.6.2 after considering proposed mitigation measures to reduce or avoid adverse effects.

4.7 COMMUNITY SERVICES AND INFRASTRUCTURE

The Community Services and Infrastructure VC is defined as those services provided by local communities and government (e.g., emergency medical services) and public infrastructure (e.g., roads) within the Project's spatial boundaries.

As Project activities may require the use of some community services and will require the use of local infrastructure, this VC will be included in the EIS.

4.7.1 Spatial Boundaries

Effects of the Project on Community Services and Infrastructure will be assessed at one spatial boundary, which is defined by the community service resources available in the region of the Project, and the area in which Project activities will use infrastructure. This spatial boundary will be defined in the EIS once additional information about the Project activities and infrastructure are known.

4.7.2 Significance Criteria

A significant adverse residual effect occurs when there is an exceedance of available capacity, or a substantial decrease in the quality of a service provided, on a persistent and ongoing basis, which cannot be mitigated with current or anticipated programs, policies, or mitigation measures.

4.7.3 Existing Conditions

Primary ground access to the Project Area will likely occur via Highway 1 located less than 2 km from the northern boundary of the Project Area. Highway 19 runs north-south from Highway 1 along the eastern boundary of the Project Area and Provincial Road No. 612 runs north-south from Highway 1 within the western portion of the Project Area. Within the Project Area there is also a network of maintained gravel grid roads.

There are no commercial accommodations available in the towns or villages near the Project Area. The nearest commercial accommodations are located in the city of Swift Current.

Medical services in the Project's region include the Hodgeville health center located in the town of Hodgeville approximately 3 km south of the Project Area, and the Cypress Regional Hospital located in Swift Current approximately 36 km west of the Project Area.

4.7.4 Environmental Effects Analyses

To assess the effects of the Project on Community Services and Infrastructure, baseline conditions within the spatial boundaries of the Project will be characterized using available online resources. The Project's predicted effects on required services and local infrastructure will be evaluated by considering the following effects pathways:

- Change in infrastructure and services
- Change in accommodation availability
- Change in transportation infrastructure

Significance of residual effects to Community Services and Infrastructure will be determined using the criteria outlined in Section 4.7.2 after considering proposed mitigation measures to reduce or avoid adverse effects.

4.8 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

Effects of the environment on the Project are defined as those adverse or positive effects on the Project activities resulting from environmental conditions. Those conditions include natural and anthropogenic variables and events, such meteorological and climate variables, seismic events, erosion, and fires. As these conditions may affect the operation of the Project and interact with the Project to cause effects on VCs included in the EIS, effects of the environment on the Project will be evaluated in the assessment.

4.8.1 Spatial Boundaries

The spatial boundaries within which effects of the environment on the Project are assessed are limited to the PDA. Environmental conditions outside the PDA where there is no Project infrastructure are not anticipated to result in direct effects on the Project. Indirect effects on associated infrastructure, such as transmission lines owned and operated by outside parties, are not included in the scope of this effects assessment.

4.8.2 Significance Criteria

For the purposes of the EIS, a significant adverse residual effect of the environment on the Project is one that would result in one or more of the following conditions:

- A substantial change (i.e., by more than one construction season) in the construction schedule
- A long-term interruption in production (e.g., energy cannot be generated or transmitted to the electrical grid)
- Damage to the Project that would cause a measurable increase in health and safety risk to Project personnel

- Damage to the Project that would be technically or economically infeasible to repair

4.8.3 Existing Conditions

Information on existing conditions for this EIS component has been included in Sections 4.1 to 4.7 and is not repeated in this section.

4.8.4 Environmental Effects Analyses

To assess the effects of the environment on the Project, historical data on meteorological events and natural disturbances (e.g., fire regimes) will be characterized for the Project Area using existing resources.

Effects analyses will examine the probabilities of significant adverse effects of the environment on the Project using the significance criteria described in Section 4.8.2, after considering mitigation, contingency planning, and Project design considerations.

4.9 ACCIDENTS AND MALFUNCTIONS

The assessment of environmental effects addresses those potential effects predicted to occur during the planned Project activities. Unplanned events, such as accidents and malfunctions, may occur and could result in adverse effects on the environment. These potential accidents and malfunctions will be addressed in a separate section of the EIS.

The types of accidents and malfunctions that may result during Project activities and their potential to occur will be characterized using historical information from similar projects located in regional, national and possibly international locations, where applicable. The characterized effects of those unplanned events described will be considered in the environmental context of the Project location.

For each potential type of accident or malfunction, a screening will be conducted to determine whether there is a complete effects pathway to cause an adverse effect on the VCs considered in the EIS. If a complete effects pathway exists, an assessment of effects using the same process described for each VC will be conducted. This effects assessment will also consider potential contingency plans and mitigation measures in place to reduce or avoid effects of accidents and malfunctions.

Cumulative environmental effects resulting from accidents and malfunctions will not be included in the EIS, as it is not reasonable to anticipate overlapping accidents and malfunctions of the Project and other projects or activities.

5.0 DECOMMISSIONING, RECLAMATION AND INSTITUTIONAL CONTROL

The expected lifespan of the Project's wind turbines, the primary structural components of the Project, is approximately 25 years. At the end of this period, the Project fate may follow several paths that include either replacement (i.e., repowering) or reconditioning of turbines or decommissioning of the Project. In the event that the Project would be fully decommissioned, appropriate decommissioning plans, environmental protection plans, and other required planning documents would be generated in consultation with appropriate regulatory authorities.

As regulatory requirements for the decommissioning of a wind energy project may change between approval of the Project and the date of its potential decommissioning, the EIS will include a conceptual framework for the decommissioning of the Project. This will include a reclamation plan to return the lands impacted by the Project to their state prior to construction.

Should a portion of the Project be sited on Provincial Crown Land, requirements for institutional control will be considered in the development of a decommissioning and reclamation plan in accordance with *The Reclaimed Industrial Sites Act* (Government of Saskatchewan 2006).

6.0 CONDITIONS MANAGEMENT

6.1 COMMITMENTS REGISTER

The EIS will contain a tabulated list of commitments proposed by the Proponent in what will be termed the commitments register. This register will include commitments towards mitigation on the part of the Proponent and other parties involved in the Project, such as contractors. It will also summarize proposed mitigation to address cumulative effects of the Project.

Commitments will include mitigation organized to reduce or avoid effects on the environment by VC, and will also include follow-up monitoring and related commitments. Commitments identified in the register will include all VCs, including those scoped out of the EIS, if the scoping decision was based on original committed mitigation (i.e., previous to assessment).

7.0 REFERENCES

Acton, D.F., G.A. Padbury, C.T. Strushnoff, L. Gallagher, D. Gauthier, L. Kelley, T. Radenbaugh and J. Thorpe. 1998. The Ecoregions of Saskatchewan. Canadian Plains Research Centre, University of Regina, Regina SK.

AAFC. 2015. AAFC Annual crop inventory. Available at: http://www.agr.gc.ca/atlas/supportdocument_documentdesupport/aafcCropTypeMapping/en/ISO%2019131_AAFC_Annual_Crop_Inventory_Data_Product_Specifications.pdf. Accessed: December 2016.

Environment Canada (EC). 2013. Bird Conservation Strategy for Bird Conservation Region 11 in the Prairie and Northern Region: Prairie Potholes – Abridged Version. Government of Canada, Environment Canada. 24 pp. Available at: https://www.ec.gc.ca/mbc-com/default.asp?lang=En&n=47D1FA51-1. Accessed: January 2017.

Filion, F.L., E. DuWors, P. Boxall, P. Bouchard, R. Reid, P.A. Gray, A. Bath, A. Jacquemot and G. Legare. 1993. The importance of wildlife to Canadians: highlights of the 1991 survey. Canadian Wildlife Service, Environment Canada. Ottawa, ON.

Government of Saskatchewan. 2006. *The Reclaimed Industrial Sites Act.* Available at: http://www.publications.gov.sk.ca/details.cfm?p=12175 Accessed: January, 2017

Saskatchewan Geological Survey. 2016. Mineral Resource Map of Saskatchewan, 2016 edition. Saskatchewan Geological Survey Miscellaneous Report 2013-01. Available at: http://publications.gov.sk.ca/documents/310/93743-ResourceMap2016.pdf. Accessed: January 2017.

Saskatchewan Ministry of Economy. 2017. Oil and Gas InfoMap. Available at: http://www.infomaps.gov.sk.ca/website/SIR_Oil_And_Gas_Wells/viewer.htm. Accessed: January 2017.

Saskatchewan Ministry of Environment (SKMOE). 2014a. *Guidelines for the Preparation of the Terms of Reference.* Available at: http://www.publications.gov.sk.ca/details.cfm?p=78869. Accessed: January 2017.

SKMOE. 2014b. *Proponents Guide – Consultation with First Nations and Metis in Saskatchewan Environmental Impact Assessment.* Available at: http://www.environment.gov.sk.ca/EAProponentConsultationGuidelines. Accessed: January 2017.

SKMOE. 2015. *Saskatchewan Activity Restriction Guidelines for Sensitive Species*. Available at: http://publications.gov.sk.ca/documents/66/92181-Saskatchewan%20Activity%20Restriction%20Guidelines%20for%20Sensitive%20Species%20-%20September%202015-1.pdf. Accessed: January 2017.

SKMOE. 2016. *Wildlife Siting Guidelines for Saskatchewan Wind Energy Projects.* Available at: http://publications.gov.sk.ca/documents/66/94283-Wind%20Siting%20Guide%20September%2028.pdf. Accessed: January 2017.

Statistics Canada. 2016. 2011 Census of Population Program online database. Available at: https://www12.statcan.gc.ca/census-recensement/index-eng.cfm Accessed: January, 2017

Stewart, R.E. and H.A. Kantrud. 1971. Classification of Natural Ponds and Lakes in the Glaciated Prairie Region. Resource Publication 92, Bureau of Sport Fisheries and Wildlife, U.S. Fish and Wildlife Service, Washington, D.C. Jamestown, ND: Northern Prairie Wildlife Research Center Online. Available at: http://www.npwrc.usgs.gov/resource/wetlands/pondlake/index.htm (Version 16APR1998). Accessed: January 2017.

Water Security Agency. 2017. Water Wells Information Database. Online tool available at: https://gis.wsask.ca/html5A/Index.html Accessed: January, 2017

Appendix B PROVINCIAL AND FEDERAL SPECIES RANKING DEFINITIONS

Category	Definition
SKCDC[1]	
S1	Critically imperiled – may be especially susceptible to extirpation because of some factor of its biology.
S2	Imperiled – may be susceptible to extirpation because of some factor of its biology.
S3	Vulnerable – may be susceptible to extirpation by large scale disturbances.
S4	Apparently secure – uncommon, not rare but may be of long-term concern.
S5	Secure – common, widespread, and abundant.
Modifiers for SKCDC Ranks	
A	Accidental or causal in the province, including species recorded infrequently that are far outside their range (birds or butterflies).
B	For migratory species, rank applies to the breeding population in the province.
N	For migratory species, rank applies to the non-breeding population in the province.
M	For migratory species, rank applies to the transient population.
H	Historical occurrence but without recent verification (e.g., within 20 years).
U	Status uncertain and species unrankable due to lack of information.
X	A species that is believed to be extinct or extirpated.
NA	Conservation status is not applicable to this species (e.g., exotic species).
NR	Species is not yet ranked.
?	Can be added to any rank to denote an inexact numeric rank (e.g., S1? = believed to be 5 or fewer occurrences, but some doubt exists concerning status).
SK Wildlife Act[2]	
Extirpated	A species that no longer exists in the wild in Saskatchewan but exists in the wild outside the province.
Endangered	A species facing imminent extirpation or extinction.
Threatened	A species likely to become endangered if limiting factors are not reversed.
Vulnerable	A species of special concern because of low or declining numbers due to human activities or natural events but that is not endangered or threatened.
SARA[3]	
Extinct	A wildlife species that no longer exists.
Extirpated	A wildlife species that no longer exists in the wild in Canada, but exists elsewhere in the wild.
Endangered	A wildlife species that is facing imminent extirpation or extinction.
Threatened	A wildlife species that is likely to become an endangered species if nothing is done to reverse the factors leading to its extirpation or extinction.
Special Concern	A wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.

Category	Definition
COSEWIC[4]	
Extinct	A wildlife species that no longer exists.
Extirpated	A wildlife species that no longer exists in the wild in Canada, but exists elsewhere in the wild.
Endangered	A wildlife species facing imminent extirpation or extinction.
Threatened	A wildlife species likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.
Special Concern	A wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.
Data Deficient	A wildlife species for which there is insufficient information to resolve a species' suitability for assessment or to permit an assessment of the species' risk of extinction.
Not at Risk	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.
SOURCES: [1] SKCDC 2016. [2] SKMOE 2013. [3] Government of Canada 2002. [4] COSEWIC 2016.	

Appendix C REPRESENTATIVE SITE PHOTOGRAPHS

October 26, 2016
PHOTO 1 Cultivated land.

October 27, 2016
PHOTO 2 Grassland.

October 27, 2016
PHOTO 3 Cultivated land with grassland hilltops.

October 27, 2016
PHOTO 4 Hayland.

Appendix D STEWART AND KANTRUD (1971) WETLAND CLASSIFICATION

Wetland Class	Central Zone	Description
Class I – ephemeral ponds	low prairie zone	Ephemeral ponds occur in small swales and contain species such as Kentucky bluegrass (*Poa pratensis*).
Class II – temporary ponds	wet meadow zone	In freshwater temporary ponds, the central wet meadow zone is the deepest part of the wetland area and is usually dominated by western wheatgrass (*Pascopyrum smithii*) and foxtail barley (*Hordeum jubatum* ssp. *jubatum*).
Class III – seasonal ponds	shallow marsh zone	Seasonal ponds are wetlands with a shallow marsh zone dominating the deepest part of the wetland area. These ponds are frequently surrounded by a ring of willows with a wet center containing sedges (*Carex* spp.).
Class IV – semi-permanent ponds	deep marsh zone	In semi-permanent ponds and lakes, the deep marsh zone dominates the deepest part of the wetland area. Common cattail (*Typha latifolia*) and bulrushes (*Scirpus* spp.) are typical emergent species.
Class V – permanent ponds	permanent open water zone	The permanent open water zone dominates the deepest part of the wetland area and is devoid of emergent vegetation.
Class VI – alkali ponds	intermittent-alkali zone	The intermittent-alkali zone is the deepest part of the wetland area. This zone may be devoid of emergent vegetation or beaked ditch grass (*Ruppia maritima*) may be present.