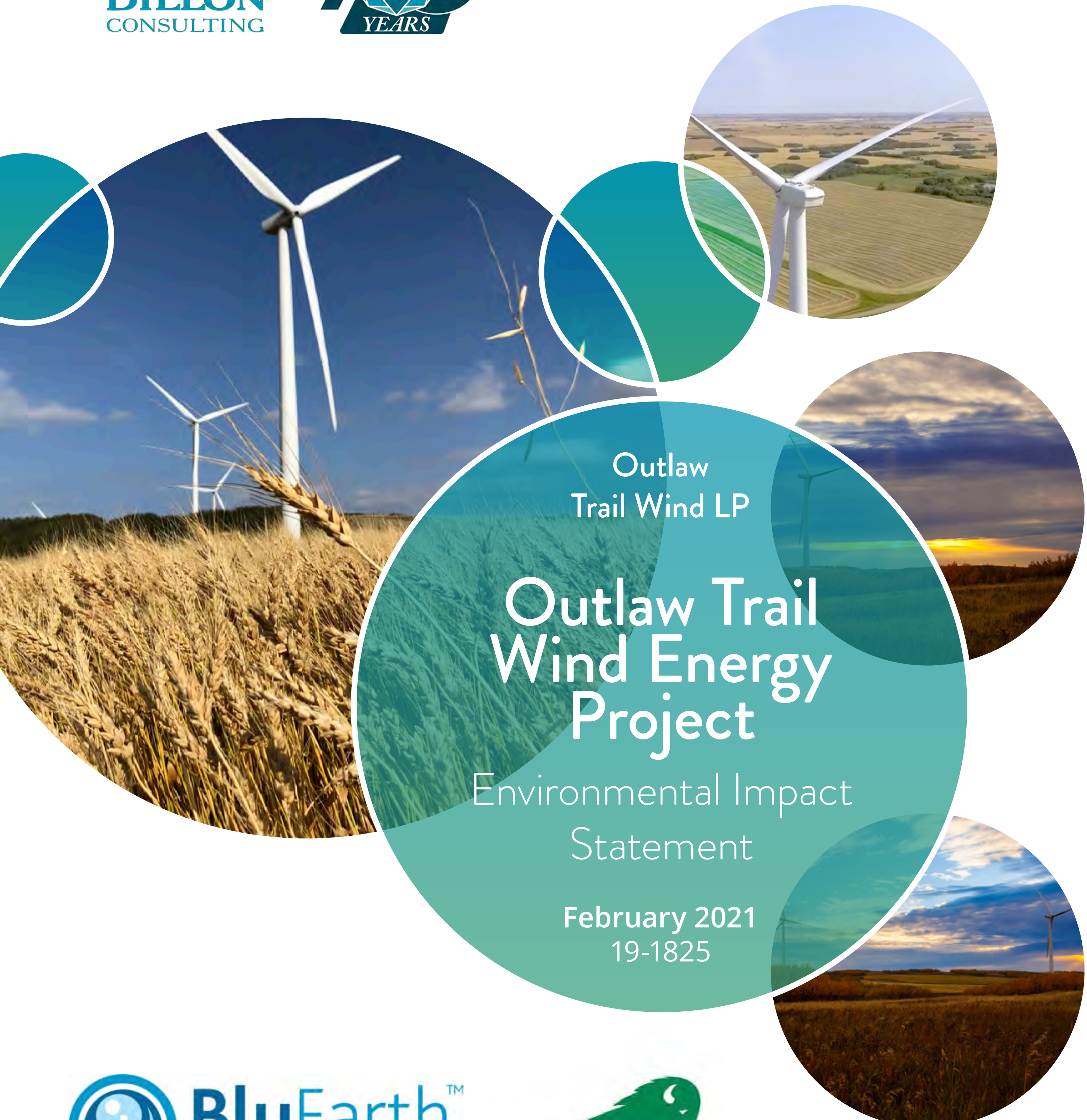

Outlaw Trail Wind LP

Outlaw Trail Wind Energy Project

Environmental Impact Statement

February 2021

19-1825

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Acronyms, Abbreviations, Definitions

AAFC	Agriculture and Agri-Food Canada
AEP	Alberta Environment and Parks
AHPP	Aquatic Habitat Protection Permit
AMP	Adaptive Management Plan
ASL	Ambient Sound Level
AUC	Alberta Utilities Commission
BCR	Bird Conservation Region
BluEarth	BluEarth Renewables Inc.
BMP	Best Management Practice
BSC	Bird Studies Canada
BSL	Basic Sound Level
CER	Canada Energy Regulator
CLC	Community Liaison Committee
CLI	Canada Land Inventory
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
dBA	A-weighted decibels
Dillon	Dillon Consulting Limited
EA	Environmental Assessment
EASB	Environmental Assessment and Stewardship Branch
ECCC	Environment and Climate Change Canada
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMP	Environmental Management Plan

ENV	Saskatchewan Ministry of Environment
EPP	Environmental Protection Plan
ERP	Emergency Response Plan
ESRD	Environment and Sustainable Resource Development
ESRI	Environmental Systems Research Institute
FHQ	File Hills Qu'Appelle
FTE	Full-time equivalent
GDP	Gross Domestic Product
GIS	Geographic Information System
GPS	global positioning system
ha	hectare
HABISask	Hunting, Angling and Biodiversity Information
HCB	Heritage Conservation Branch
HDD	horizontal directional drilling
HRIA	Heritage Resource Impact Assessment
IBA	Important Bird Area
IEC	International Electrochemical Commission
IPCC	Intergovernmental Panel on Climate Change
IPP	Independent Power Producers
km	kilometre
km/h	kilometre per hour
kv	kilovolt
LAA	Local Assessment Area
LEQ	Energy Equivalent Sound Level
m	metre

m^2	square metre
m/s	metre per second
MBCA	*Migratory Birds Convention Act*
MET	meteorological
MW	megawatt
NIA	Noise Impact Assessment
NuWind	NuWind Energy Corporation
NGO	Non-government organization
OTW LP	Outlaw Trail Wind LP
PDA	Project Development Area
PPA	Power Purchase Agreement
PPPI	Public Pastures Public Interest
PSL	Permissible Sound Level
RAA	Regional Assessment Area
RCMP	Royal Canadian Mounted Police
RFP	Request for Proposals
RFQ	Request for Qualifications
RM	Rural Municipality
RWDI	RWDI Inc.
SAR	Species at Risk
SARA	*Species at Risk Act*
SaskPower	Saskatchewan Power Corporation
SGIC	Saskatchewan Geospatial Imagery Collaboration
SK	Saskatchewan
SKCDC	Saskatchewan Conservation Data Center

SKSID	Saskatchewan Soil Information Database
SOMC	Species of Management Concern
SOP	Standard Operating Procedures
Stantec	Stantec Consulting Ltd.
TOR	Terms of Reference
TPP	Technical Project Proposal
UNFCC	United Nations Framework on Climate Change
USA	United States of America
VEC	Valued Ecosystem Components
W2M	West of the Second Meridian
WEP	Wind Energy Project
WHPA	*Wildlife Habitat Protection Act*
WTG	wind turbine generators

Executive Summary

Outlaw Trail Wind LP (OTW LP) is proposing to construct the Outlaw Trail Wind Energy Project (the Project), an up to 200 megawatt (MW) power generating facility located approximately 20 kilometres (km) east of the Village of Coronach in south-central Saskatchewan, in the rural municipalities (RMs) of Hart Butte (RM No. 11) and Happy Valley (RM No. 10). The Project will have a maximum of 33 wind turbine generators (WTGs) constructed; however, OTW LP has included 37 WTG locations in its Project layout to account for 4 alternative locations to allow for flexibility, should unknown technical constraints (e.g., geotechnical limitations) be encountered at one or more of the 37 locations. Other permanent Project infrastructure includes access roads to each WTG, pad-mount transformers, above and below-ground electrical collector system, a transformer substation, communications and control system, operations and maintenance building and other ancillary equipment.

Project Proponent

OTW LP is a joint venture entity that was formed through a partnership between BluEarth Renewables Inc. (BluEarth) and NuWind Energy Corporation (NuWind). BluEarth is an independent renewable energy developer specializing in the acquisition, development, construction and operation of wind, hydro and solar projects in Canada. BuEarth's current renewable portfolio in Canada includes 17 facilities in operation, 4 facilities under construction, and 7 projects under development.

NuWind is a wholly-owned subsidiary of FHQ Developments, the investment and economic development corporation for the File Hills Qu'Appelle Tribal Council, which is owned by 11 Nations. Through the formation of OTW LP, the relationship between NuWind and BluEarth is focused on growing the participation and equity of an Indigenous business into a major renewable energy project in Saskatchewan.

Regulatory Framework

In accordance with the *Environmental Assessment Act, 1980* (Government of Saskatchewan 1980a) OTW LP submitted a Technical Project Proposal (TPP) to the Saskatchewan Ministry of Environment (ENV) – Environmental Assessment and Stewardship Branch (EASB) for the Project in 2018, following the guidelines included in *Technical Proposal Guidelines – A Guide to Assessing Projects and Preparing Proposals under the Environmental Assessment Act* (Government of Saskatchewan 2014). The TPP was submitted with the intention to inform the ENV – EASB of the Project, and facilitate the Ministerial Determination if the Project meets the criteria included in Section 2(d) of the *Environmental Assessment Act*, in which the Project would therefore be deemed a "development", and subsequently require the completion of an Environmental Impact Assessment (EIA).

Upon review of the TPP, the ENV – EASB issued a Ministerial Determination to OTW LP in which it was determined that the Project met the criteria included in Section 2(d) of the *Environmental Assessment*

Act, and is therefore considered a "development", and is required to undergo an EIA. The Ministerial Determination was based on the conclusion that the Project may a) have an effect on unique, rare, or endangered feature(s) of the environment, and b) have a significant impact on the environment or necessitate a further development that is likely to have a significant impact on the environment.

Since submitting the TPP, OTW LP has revised the Project layout and design in response to comments received during the TPP review. These changes are outlined herein for comparison to the previous layout and design. This Environmental Impact Statement (EIS) is intended to fulfill the EA requirements described in the *Environmental Assessment Act*. It has been prepared in accordance with the Terms of Reference (TOR) developed for the Project and approved by ENV via email on January 29, 2020.

Project Need and Benefits

The Province of Saskatchewan is experiencing continually increasing power demands, with record power usage recorded in 2017. In 2015, the Government of Saskatchewan committed to producing 50% of its energy from renewable sources by 2030, an increase from approximately 25% at the time (Saskatchewan Chamber of Commerce 2019). This 25% increase in renewable energy would be obtained through mainly wind, solar, geothermal and biomass. SaskPower estimates power needs of 7,000 MW by 2030, with approximately 3,500 MW of this being from renewable energy, and approximately 1,050 MW (30%) being from wind power. The Project will assist in obtaining the Government of Saskatchewan and SaskPower goal of 50% renewable energy generating capacity by 2030 for the Province of Saskatchewan.

Project Description

The Project is located in the RMs of Happy Valley and Hart Butte, approximately 5 km north of Big Beaver and 22 km south of Bengough, in south-central Saskatchewan. The Project location was selected based on a desktop constraints analysis and associated field reconnaissance surveys completed in 2015. The desktop constraints analysis and field reconnaissance surveys identified potential environmental constraints related to sensitive environmental features including land cover, wildlife and heritage resources. Following the initial issuance of *Wildlife Siting Guidelines for Saskatchewan Wind Energy Projects* (ENV 2017), the Project was revised. Additional setback distances established through the RM of Happy Valley and Hart Butte zoning bylaws.

Development of the Project layout followed an iterative approach as regulatory guidance within Saskatchewan evolved, and to adapt in response to identified site constraints through the evaluation process. The final Project layout was based on the findings of the desktop constraints analysis and reconnaissance surveys, community and landowner input, regulatory review, available technology (e.g., turbine models) and the results of detailed field studies.

The final layout consists of a maximum of 33 WTG locations and 4 alternative locations. Each WTG will have a nameplate generating capacity of 6.2 MW, though the selected turbine model will be determined at the time of procurement. The proposed Project Development Area (PDA) encompasses approximately 182.5 ha, a substantial reduction from the 278 ha PDA proposed in the 2018 TPP. Only 25.1 ha are expected to be occupied by permanent infrastructure compared to the 29 ha from the TPP layout. Of the 182.5 ha PDA, 157.5 ha will have light and temporary disturbance as temporary construction areas.

The Project activities will be comprised of four phases: development, construction, operation and maintenance, and decommissioning. The development phase of the Project is underway, and includes planning with SaskPower, environmental studies and permitting and approvals, stakeholder engagement, project design and engineering, equipment procurement and Project financing.

Construction will begin when all stages of the development phase have been completed and will be dependent on selection of the Project by SaskPower, SaskPower's interconnection line, regulatory approvals, equipment supply and the seasonal conditions. Construction is anticipated to begin in 2022, with Project commissioning anticipated in 2023. The construction phase will be the most intensive phase of the Project in the context of the number of on-site workers and the activities completed, which will include the following:

- Site preparation, including:
    - Vegetation clearing;
    - Topsoil stripping; and
    - Grading and development of WTG locations, MET tower locations, access roads, substation, and temporary workspaces;
- Installation of WTG and MET tower foundations;
- Erection of WTGs and MET towers;
- Installation of collector lines and substation infrastructure; and
- Post-construction reclamation.

The operation and maintenance phase comprises the majority of the Project lifespan, as the WTGs are anticipated to operate for a duration of 25 years (with the exception of periodic, temporary shutdowns for maintenance or during unfavourable weather). The WTGs will operate in accordance with industry standards and within the operational capacity of the equipment. Routine and unplanned maintenance will be completed as required during this phase.

At the end of the operational lifespan of the WTGs, they may be reconditioned or replaced, depending on power demands and future technological advancements; otherwise the Project will be decommissioned, and the Project lands reclaimed to an acceptable pre-disturbance condition, or an alternate land capability as determined through consultation with landowners and regulatory agencies at that time.

Engagement

OTW LP is committed to the engagement and communication with stakeholders, government and regulatory agencies and Indigenous communities throughout all phases of the Project. Engagement activities for the Project began in 2015 and will continue beyond decommissioning. Targeted audiences for engagement have included the public (individual landowners, and local community members), Indigenous communities, municipal regulatory agencies (i.e., RM councils) and provincial regulators (i.e., ENV).

To date, the consultation and engagement program has included the following activities:

- Three public open houses in the community of Big Beaver, SK, held on June 7, 2016, June 8, 2017 and December 10, 2019;
- Six in-person meetings with ENV, held on June 27, 2016, March 30, 2017, January 18, 2018, December 17, 2018, April 25, 2019 and December 11, 2019;
- Four presentations to the RMs, held in March and December 2016, December 2017 and February 2019;
- Information package mail-outs and follow-up phone conversations with members of the Wood Mountain Lakota First Nation and the Willow Bunch Métis Local 139;
- Numerous in-person meetings, telephone calls, direct mailing, and emails with stakeholders; and
- Publication of newspaper notices and posting of information on a dedicated Project website.

A summary of comments, questions and concerns raised during engagement activities, as well as how feedback from interested parties was considered during Project planning, are included in the EIS.

Environmental Assessment Scope and Methods

The scope of the EA focuses on a selection of VECs, which are identified as the biophysical or socio-economical attributes of the environment that hold important value from a scientific, cultural, legal, economic or aesthetic perspective. Further, the selected VECs have the potential to be affected by the Project and/or cumulative effects in combination with other past, present, or reasonably foreseeable future projects or developments in the region.

As outlined in the TOR, the following seven VECs were selected as the focus of the EIS:

- Acoustic Environment;
- Terrain and Soil;
- Vegetation and Wetlands;
- Wildlife and Wildlife Habitat;
- Heritage Resources;
- Employment and Economy; and
- Community Services and Infrastructure.

Once selected, the potential effects of the Project on each of the VECs were described, including the pathways by which the effects may occur and the measurable parameters used to evaluate each effect. Spatial and temporal boundaries, criteria by which residual effects were characterized, and significance thresholds were then defined in the scoping for each VEC-specific effects assessment.

The existing conditions were described in the EIS, including a high-level general overview of the region, and a detailed description of existing conditions specific to each of the VECs. This characterization of existing conditions is important to evaluate potential effects resulting from Project activities, and to allow for trends and changing conditions in the environment to be discerned, as appropriate. The information was limited to that which was necessary to effectively assess the environmental effects of the Project, and to facilitate the development of recommendations and strategies for mitigation, monitoring, and follow-up to address these environmental effects.

The potential Project-specific environmental effects and subsequent cumulative environmental effects (where applicable) were assessed in consideration of the existing conditions of the selected VECs and application of proposed mitigation. The resulting residual effects were then characterized based on the previously defined criteria.

A cumulative effects assessment was also conducted for each VEC where Project-specific adverse residual effects were identified, to determine if the effects may interact in a cumulative manner with the potential adverse residual effects of other past, present, or reasonably foreseeable or publicly known future projects or physical activities in a defined Regional Assessment Area (RAA).

The significance of Project-specific and cumulative residual effects on each VEC was determined, based on the predetermined significance criteria. The effects assessment also described follow-up monitoring programs proposed for each VEC, to evaluate the accuracy of the EA findings and effectiveness of the proposed mitigation.

Environmental Setting

The Project is located in the Wood Mountain Plateau and Coteau Lakes Upland Landscape Areas of southwestern Saskatchewan's Mixed Grassland Ecoregion (Acton *et al*. 1998). The Mixed Grassland Ecoregion is characterized by a semiarid climate, with a mean annual temperature of 3.5°C, with a mean temperature of 16°C in the summer and -10°C in the winter. On average, this region receives between 250 to 350 mm of precipitation. Topography in the ecoregion is highly variable, including level to hummocky morainal uplands dominated by agricultural cropland, interspersed with a large network of gullies and creeks dominated by rangeland. Soils in the ecoregion are dominated by Brown Chernozems in upland area, Solonetzic soils in depressional areas and regosols on steep-sloped gullies and river valleys. The natural vegetation in the Mixed Grassland Ecoregion is dominated by spear grasses, blue grama grass, wheat grasses with sub- dominate june grass and dryland sedges. Valleys, shaded slopes and depressions with higher soil moisture support stands of trees and shrubs. This ecoregion is dominated by cultivated and agricultural land (62%) and native grassland (31%) (Hammermeister *et al.* 2001).

Within the Project Area, native grassland is mainly found in areas with high variability in topography (i.e., knob and kettle landforms, coulees and gullies associated with the Big Muddy Valley), where the terrain and soil conditions present severe limitations to agricultural crop production. Wetlands within the Project Area predominately consist of isolated ephemeral, temporary and seasonal wetlands scattered throughout upland areas, ephemeral and seasonal drainages within swales of coulees and gullies and dugouts, which are anthropogenic water bodies created for livestock production that often function as permanent wetlands. No historical records of plant species of management concern (SOMC) were documented in the Project Area (Government of Saskatchewan 2020), excluding those that were recorded during the baseline field surveys for this Project, which have been incorporated into the effects assessment on vegetation and wetlands in this EIS (**Section 8**).

Grassland habitats (e.g., native prairie and tame pasture) provide suitable habitat for a variety of wildlife species, including upland nesting migratory birds, ungulates, rodents and reptiles. Wetlands and drainages serve as the primary habitat for waterfowl, shorebirds and amphibians; they also provide a source of water for many terrestrial species. Shrublands, while typically limited to gullies, depressions and areas of sandy soils, provide nesting habitat for tree and shrub nesting bird species, as well as thermal and escape cover for a variety of terrestrial wildlife species.

The Project lands do not overlap any designated wildlife conservation lands, including wind energy project avoidance zones, WHPA designated lands, Fish and Wildlife Development Fund designated lands, registered Crown Conservation Easements, or National Wildlife Areas. The nearest designated lands include WHPA designated lands, which are located along the north and east boundaries of the Project area, and one quarter-section registered as a Crown conservation Easement, which is located in the eastern portion of the Project region, though it is avoided by the Project. These designated lands are also identified as wind energy project avoidance zones. The nearest IBAs to the Project are the Big Muddy Lake IBA, located approximately 7.3 km to the east, and the Willow Bunch Lake IBA, located approximately 11.1 km to the northwest.

Within the Project Area, four historical records of wildlife species of management concern (SOMC) have been documented (Government of Saskatchewan 2020), excluding those that were recorded during the baseline field surveys for this Project, which have been incorporated into the effects assessment on wildlife and wildlife habitat in this EIS (**Section 9**). These documented species include Sprague's pipit, eastern yellow-bellied racer, and smooth greensnake (2 records).

The Project is located in a sparsely populated, rural environment. Land use in the Project Area is primarily limited to the agriculture industry (i.e., production of annual crops, perennial forage crops, and livestock).

Summary of Effects Assessment Results

Acoustic Environment

The assessment of effects on the acoustic environment VEC focused on the effects of noise emissions from Project activities on existing noise receptors within the Local Assessment Area (LAA). Currently, the Government of Saskatchewan does not have any standards or guidelines specific to the acoustic environment. As such, effects on the acoustic environment were assessed using the specific guidelines for wind energy projects set forth by the Alberta Utilities Commission (AUC) under Rule 012: Noise Control (AUC 2019). Based on the AUC guidelines, the daytime and nighttime Permissible Sounds Levels (PSL) were defined as 50 dBA and 40 dBA, respectively, for all noise receptors within the LAA.

A Noise Impact Assessment (NIA) was completed for the Project by RWDI Inc. (see **Appendix F)**. The NIA used sound level prediction software to model the cumulative sound emissions from the Project, and predict the resulting sound levels at each noise receptor within the LAA. Based on the findings of the NIA, the potential residual effects on the acoustic environment will not exceed the guidelines as defined in the AUC Rule 012 (AUC 2019). As such, the adverse residual effects of the Project on the acoustic environment are predicted to be not significant.

Terrain and Soils

The assessment of effects on the terrain and soils VEC focused on the effects of Project activities on terrain integrity, soil quantity and soil quality. Potential effects on terrain and soil are largely limited to activities during the construction phase, including vegetation clearing, topsoil stripping, grading excavating, trenching and Project vehicle and equipment traffic. These activities could result in localized changes to the surface expression on the landscape, soil loss due to admixing and erosion, soil compaction and/or contamination from spills or leaks.

Project activities will result in localized changes in terrain and soil within the PDA. However, through the application of diligent mitigation measures and industry best management practices (BMPs), the magnitude of these changes within the PDA is low, and is considered negligible on a regional scale. These changes are considered temporary in nature, as the disturbed areas will be re-contoured and soils will be redistributed when the PDA is reclaimed to an equivalent land capability. As such, the adverse residual effects on terrain and soil are predicted to be not significant.

Vegetation and Wetlands

The assessment of effects on the vegetation and wetlands VEC focused on the effects of the Project on vegetation community diversity, plant species diversity (including plant SOMC and non-native invasive species) and wetland area and function. The PDA comprises a total area of 182.5 ha, which is predominately cropland (131.2 ha or 71.9% of the PDA). Collectively, native land cover (i.e., grassland, wetlands, drainages, broadleaf lands and shrublands) account for 9.4 ha or 5.1% of the PDA, the majority of which (8.7 ha or 93%) will be temporarily affected during construction through establishment of temporary workspaces. Following the completion of construction activities, these temporarily affected areas of the PDA will be passively or actively reclaimed to their equivalent pre-construction conditions. The remaining 0.7 ha of native land cover within the PDA will be affected by Project infrastructure that will be installed for the duration of Project operation (i.e., access roads and overhead collector lines).

A total of 21 provincially-tracked plant SOMC were observed in 168 locations during vegetation community and rare plant surveys. OTW LP's iterative approach to development and siting of the final layout resulted in the avoidance of the majority of these identified occurrences and their respective 30 m setback distances, as outlined in the *Saskatchewan Activity Restriction Guidelines for Sensitive Species* (ENV 2017). As a result, only 9 plant SOMC were identified in 28 locations within 30 m setback distance but outside of the PDA, and 6 SOMC were observed in 15 locations within the PDA boundary. These observed plant SOMC within the PDA are located within the ROWs of underground and overhead collector lines, access roads and WTG temporary workspace. It is anticipated that these project components can be realigned through further layout refinements and adjustments on-site to avoid these observed plant SOMC occurrences.

The PDA has been designed to avoid wetlands to the extent possible; as such, approximately 0.7 ha of wetland and drainage land cover are intersected by the PDA, specifically temporary workspace areas (i.e., temporary workspaces for access roads, overhead and underground collector lines). No permanent infrastructure will be installed or developed within wetland areas. Further, temporary workspaces will be sited and collector lines will be installed to avoid wetland areas entirely.

Overall, the predicted residual effects on vegetation and wetlands are anticipated to be adverse, low in magnitude, limited to the extents of the PDA, long-term in duration, occur as single events (i.e., during construction or decommissioning phases) and reversible through reclamation. The effects have been largely addressed during Project design by avoiding native land cover classes, and through implementation of appropriate mitigation measures and habitat offsetting when avoidance is not possible. Therefore, the adverse residual effects on vegetation and wetlands are predicted to be not significant.

Wildlife and Wildlife Habitat

The assessment of effects on the wildlife and wildlife habitat VEC focused on the effects of the Project on wildlife habitat availability and mortality risk (including wildlife SOMC). A change in wildlife habitat availability can occur through direct habitat loss (i.e., conversion of suitable habitat to unsuitable habitat) and indirect habitat loss (i.e., sensory disturbances that cause wildlife to avoid areas of otherwise suitable wildlife habitat). For this assessment, suitable wildlife habitat was defined as native land cover (i.e., grassland, wetlands, drainages, broadleaf lands and shrublands) and perennial cropland (i.e., tame pasture/forage).

The PDA was sited predominately on cultivated lands (131.2 ha or 71.9% of the PDA), which provide less suitable habitat for wildlife SOMC. At baseline, 37.4 ha or 20.5% of the PDA is considered suitable wildlife habitat, most of which (27.9 ha or 74.6%) is comprised of tame pasture/forage land cover. Further, the majority (34.2 ha or 91.4%) of suitable wildlife habitat within the PDA is occupied by temporary workspaces for the construction phase, and will be returned to land cover equivalent to pre-construction conditions through post-construction reclamation. Of the 25.1 ha permanent Project footprint, the area of suitable wildlife habitat will be 3.0 ha total (12%), with most (2.3 ha) of this being in tame pasture/forage.

Indirect habitat loss due to sensory disturbance will occur in the PDA during construction; however, this disturbance will be short-term and limited to the construction phase. Best management practices will reduce or avoid this disturbance during construction to the extent possible. During the operation and maintenance phase, indirect habitat loss as a result of sensory disturbance from WTGs is expected to continue. Based on literature, the distance at which grassland songbirds experience an effect from sensory disturbance varies, but as a precautionary approach to estimate the effects of sensory disturbance, a distance of 200 m was used. As a result, the Project may result in the reduction of habitat availability by 74.5 ha of grassland and 49.6 ha of tame pasture/forage during operation and maintenance. However, the total area of indirect disturbance will likely be less because this represents the area within 200 m of the 37 turbine locations, though only 33 turbines will be constructed.

A desktop review of existing information from provincial and federal databases, satellite imagery and literature sources was completed to determine known occurrences of wildlife SOMC within the LAA and RAA. A series of field surveys was subsequently conducted in 2015, 2016, 2017 and 2019, which focused on detecting wildlife SOMC occurrences and documenting species occupancy and movement in various locations and habitat types within the LAA. These surveys included raptor stick nest surveys, bat activity surveys, bird movement surveys, sharp-tailed grouse lek surveys, breeding bird surveys, burrowing owl surveys, common nighthawk surveys, short-eared owl surveys, nocturnal amphibian auditory surveys and yellow surveys. These surveys were completed in accordance with protocols prescribed or approved by ENV.

Sensitive features associated with wildlife SOMC that were identified during field studies, as well as the applicable setback distances outlined in the *Saskatchewan Activity Restriction Guidelines for Sensitive Species* (ENV 2017) were avoided by the PDA where possible. The Project is in compliance with the guidelines (ENV 2017), with the following exceptions:

- The 1 km setback around a ferruginous hawk nest overlaps the PDA, but only at the location of a ROW for underground collector lines, which will be temporarily disturbed during construction; the nearest point of the underground collector lines is at 730 m. Construction activities within this setback will occur outside of the activity restriction period (March 15 to July 15) and be confined to the construction workspace for those components.
- The 400 m setbacks around five sharp-tailed grouse leks overlap the PDA, including underground and overhead collector line routes, access roads and /or WTG pads. Note that some leks occurred within 400 m of regularly used municipal roads. Construction activities

within the 400 m setback will occur outside of the activity restriction period (March 15 to May 15) and will be confined to the construction workspace.

- The 500 m setbacks around five northern leopard frog breeding ponds overlap the PDA, including WTGs pads, temporary workspaces, access roads, and underground and overhead collector lines. Construction activities at these locations will be confined to the construction workspace.

The Project is located south of the Big Muddy Valley, which is characterized by a ridge of forested coulees. Control sites for the bird movement surveys were sited along the valley in order to assess if this landscape feature could act as a corridor for migrating birds and therefore have higher number of birds than within the Project area. However, results from the bird movement surveys showed that bird movement rates at the control sites were similar to those within the Project area. Based on the data collected, it appears that the Big Muddy Valley does not concentrate bird movement during migration more so than the surrounding landscape. Furthermore, there are no other prominent features on the landscape near the Project area that could serve as a concentration site for birds (e.g., a large body of water), thereby lowering the potential for an increased level of interaction between the Project and birds. No clear movement corridors through the wildlife and wildlife LAA were identified, based on the data from the spring and fall bird movement surveys.

Based on the results of the bat activity surveys, bat activity rates were an average of 0.2 migratory bat passes per detector night during the 2016 spring monitoring period, 2.0 migratory bat passes per detector night in 2015 and 2.4 migratory bat passes per detector night in 2016 during the fall monitoring period (August 1 to September 10) at the elevated detectors. According to the guidelines established in the Alberta Framework (ESRD 2013b), the calculated bat activity rates for the Project fall within the moderate category for migratory bat fatality risk. However, a recent meta-study by Solick *et al*. (2020) confirmed previous meta-analysis results from Hein *et al*. (2013) that predicting the mortality risk to bats from wind energy projects using pre-construction survey data is not feasible, despite the weak relationship with small sample size reported in the Baerwald and Barclay (2009) study, which has been adopted as the guidance thresholds in the Alberta Framework (ESRC 2103b). Therefore, predicting the potential change in mortality risk of bats as a result of the Project based on pre-construction bat activity is not based on strong scientific evidence. Application of the *Adaptive Management Guidelines for Saskatchewan Wind Energy Projects* (ENV 2018) will ensure that bird and bat mortality rates are consistent with rates acceptable within Saskatchewan.

Overall, the predicted residual effects on wildlife and wildlife habitat are anticipated to be adverse, low in magnitude, variable in extent from the LAA to RAA, long-term in duration, occur as multiple irregular events. The effects have been largely addressed during Project design by avoiding native land cover classes, and through implementation of appropriate mitigation measures, including prescribed adaptive management guidelines, when avoidance is not possible. Therefore, the adverse residual effects of the Project on wildlife and wildlife habitat are predicted to be not significant.

Heritage Resources

The assessment of effects on the heritage resources VEC focused on losses of or changes to heritage resources as a result of Project activities. Heritage resources are defined in this EIS as remnants and features associated with historic and pre-contact archaeological sites, palaeontological resources, and structures of historical and/or architectural significance. The initial Project Area was referred to the Heritage Conservation Branch (HCB) of the Saskatchewan Ministry of Parks, Culture and Sport for a heritage resource review. The HCB then issued a letter identifying the quarter-sections within the Project Area that would require a heritage resource impact assessment (HRIA) if they are overlapped by the PDA.

A HRIA was completed for the Project under an Archaeological Resource Investigation Permit issued by the HCB (Permit No. 20-0118). During the field assessment, two archaeological sites were discovered within the PDA. In consideration of these findings, the PDA was revised to avoid these newly discovered sites, and a supplementary HRIA was completed to account for additional areas that were not included in the initial HRIA. No surficial or buried artifacts, features or paleosols were discovered during the field assessment. The findings from the HRIA were detailed in a technical report, which was submitted to the HCB for review. Following their review, the HCB issued a clearance letter on November 30, 2020, confirming their acceptance of the findings and recommendations from the HRIA report.

Through the application of mitigation measures, industry BMPs and compliance with the *Heritage Property Act* (Government of Saskatchewan 1980b), no residual effects on heritage resources are anticipated as a result of the Project. Therefore, potential effects on heritage resources are predicted to be not significant.

Employment and Economy

The assessment of effects on the employment and economy VEC focused on changes in the local workforce and economy as a result of Project activities. All Project activities identified will require labour and/or materials, which will result in potential effects to the local or regional workforce and economy. The predicted effects on employment and the economy as a result of the Project are anticipated to be positive in direction, moderate in magnitude, variable in extent from the LAA to RAA and beyond, short-term to medium-term in duration, and occur as single or continuous events. No specific mitigation measured were identified to reduce or avoid effects on employment and the economy, though consultation and engagement will improve the overall benefits of the Project. As the proposed Project is a partnership that includes eleven First Nations of Saskatchewan, there will be measurable economic benefits to local First Nations. As the effects are anticipated to be positive, no significance determination was made.

Community Services and Infrastructure

The assessment of effects on the community services and infrastructure VEC focused on the effects of Project activities on local transportation infrastructure due to heavy equipment traveling on municipal and provincial roads, and on the community services required for temporary staff during more intensive phases, such as construction. Through early communication with local service providers and governments, and development of Project-specific plans (i.e., Emergency Response Plans (ERPs), traffic management plans, construction safety programs), the Project is predicted to have a low or negligible effects, which may trend towards positive or adverse direction. Therefore, adverse residual effects of the Project on community services and infrastructure are not considered to be significant.

Cumulative Effects

A cumulative effects assessment was conducted for each VEC that was selected for inclusion in the EIS. The cumulative effects assessment considered the Project-specific residual effects identified for each VEC, and how they may interact in a cumulative manner with the residual effects of other past, present or reasonably foreseeable or publicly known future natural or human activities. Where no adverse residual effects on a VEC were identified following the Project-specific effects assessment, or Project's adverse residual effects are not likely to act cumulatively with the residual effects of other projects or physical activities in the RAA, a cumulative effects assessment was not carried forward for that VEC. As such, a cumulative effects assessment was not conducted for the acoustic environment, terrain and soil, heritage resources, employment and economy or community services and infrastructure VECs. Cumulative effects assessments were conducted for the vegetation and wetlands VEC and wildlife and wildlife habitat VEC. Both assessments concluded that, due to the extensive and irreversible modifications to the landscape by the conversion of native land cover for agricultural use, the cumula ve e ects on the vegeta on and wetlands and wildlife and wildlife habitat VECs are already high in magnitude and signi cant. Therefore, the Project's contribu on to those e ects is not considered measurable at the scale of the RAA. With the contribu ons of the Project-speci c residual e ects, as well as those from other future foreseeable projects, the cumula ve e ects will con nue to be signi cant.

Effects of the Environment on the Project

Effects of the environment on the Project refer to natural or anthropogenic events or forces that may affect the normal function or stability of Project-related activities or operations. The environmental factors that were the focus of the assessment included severe weather (i.e., extreme precipitation events, temperatures, wind speeds and severe storm events) and wildfires. The assessment of effects of the environment also considered how the effects of climate change may influence each of these factors throughout all phases of the Project. The assessment concluded that potential effects of the environment on the Project can be managed with appropriate and site-specific mitigation or adaptation measures, including appropriate Project design, monitoring, maintenance of facilities, and response to incidents. No adverse residual effects of the environment on the Project are anticipated; therefore, potential effects of the environment on the Project are anticipated to be not significant.

Accidents, Malfunctions and Unplanned Events

The potential occurrence of accidents, malfunctions or unplanned events (i.e., accidental release of hazardous materials, failure of WTG components, ice throw, fire, and vehicle accidents) has been considered as part of the Project design, and will continue to be considered throughout Project planning. Measures to reduce the potential occurrence of accidents, malfunctions or unplanned events will continue to be developed and updated with additional site-specific details as Project planning progresses. Safeguards will be implemented throughout the construction, operation and maintenance, and decommissioning phases, and ERPs will be developed before any work is initiated on the Project so that incidents can be managed effectively.

By ensuring that all aspects of the Project adhere to applicable codes and standards, as well as implementing the mitigation measures outlined in this EIS, as well as the Environmental Protection Plan included in **Appendix C**, the likelihood for adverse environmental effects arising from accidents, malfunctions, or unplanned events is greatly reduced. Furthermore, by implementing a site-specific ERP and management plans during all phases of the Project, the residual environmental effects that may arise from Project-related accidents, malfunctions, and unplanned events Project are not considered significant.

Monitoring and Follow-up

A range of monitoring and follow-up procedures will be implemented throughout the construction, operation and maintenance, and decommissioning phases of the Project, and extending beyond decommissioning. The monitoring and follow-up procedures are included with OTW LP's other corporate commitments in the Commitments Register in **Appendix B**.

OTW LP will retain the services of an Environmental Monitor during construction to evaluate the effectiveness of the mitigation measures included in this EIS and the EPP included in **Appendix C**. The environmental monitor will work with OTW LP and the construction contractor to implement appropriate measures and procedures, to align the Project with regulatory requirements and corporate commitments. Following construction, the Project will continue to be monitored to evaluate the effectiveness of the post-construction reclamation activities.

During the operation and maintenance phase, a post-construction bird and bat mortality monitoring program will be implemented in accordance with the Saskatchewan *Adaptive Management Guidelines for Saskatchewan Wind Energy Projects* (ENV 2018), to evaluate the actual effects of the Project on wildlife mortality risk, and identify the requirement for operational mitigation. This monitoring program will be conducted during the first two years of operation, at a minimum, and will require consultation and reporting to regulatory agencies throughout the program duration.

Prior to construction initiation, and as part of the community engagement program, OTW LP will develop a Community Liaison Committee (CLC). This CLC will be comprised of community leaders, community members and Project representatives from the development, construction, and operations teams and will be a key venue for the community to engage, discuss, and track Project issues.

Conclusion

The EA completed for the Project, and described in the EIS document, incorporated an accepted and defensible methodology to scope potential effects pathways, acquire appropriate data (through both desktop and field studies), analyze data and discuss the potential severity and likelihood of residual effects subsequent to application of mitigation measures. Using this process, the EIS concluded that there would be no significant adverse residual effects from the Project on all selected VECs (i.e., acoustic environment, terrain and soil, vegetation and wetlands, wildlife and wildlife habitat, heritage resources, employment and economy and community services and infrastructure) during all phases assessed and in consideration of normal activities of the Project as planned. Further, the EIS concluded that the Project-specific residual effects on vegetation and wetlands, as well as wildlife and wildlife habitat, would have a negligible contribution to the cumulative residual effects from past and current activities within the RAA, which were already significant. The proponent has committed to monitoring programs and follow-up studies to examine the accuracy of predictions of residual effects.

1.0 Introduction

Outlaw Trail Wind LP (OTW LP), a partnership between BluEarth Renewables Inc. (BluEarth) and NuWind Energy Corporation (NuWind), is proposing to construct the Outlaw Trail Wind Energy Project (the Project), an up to 200 megawatt (MW) power generating facility located approximately 20 kilometres (km) east of the Village of Coronach in south-central Saskatchewan, and approximately 14 km north of the Canada/USA border.

The Project is located in the rural municipalities (RMs) of Hart Butte (RM No. 11) and Happy Valley (RM No. 10) (**Figure 1-1**: Project Location). The Project will have a maximum of 33 wind turbine generators (WTGs) constructed; however, OTW LP has included 37 WTG locations in its Project layout to account for 4 alternative locations. While only up to 33 turbine locations will be built, this Environmental Impact Statement (EIS) seeks approval for all 37 locations to allow for flexibility, should unforeseen technical constraints (e.g., geotechnical limitations) be encountered at one or more of the 37 locations. Other permanent Project infrastructure includes access roads to each WTG, pad-mounted transformers, above and below-ground electrical collector system, a transformer substation, communications and control system, operations and maintenance building and other ancillary equipment.

In 2018, BluEarth submitted an Application for Ministerial Determination to the Saskatchewan Ministry of Environment (ENV) – Environmental Assessment and Stewardship Branch (EASB) for the Project. The Application included the following components:

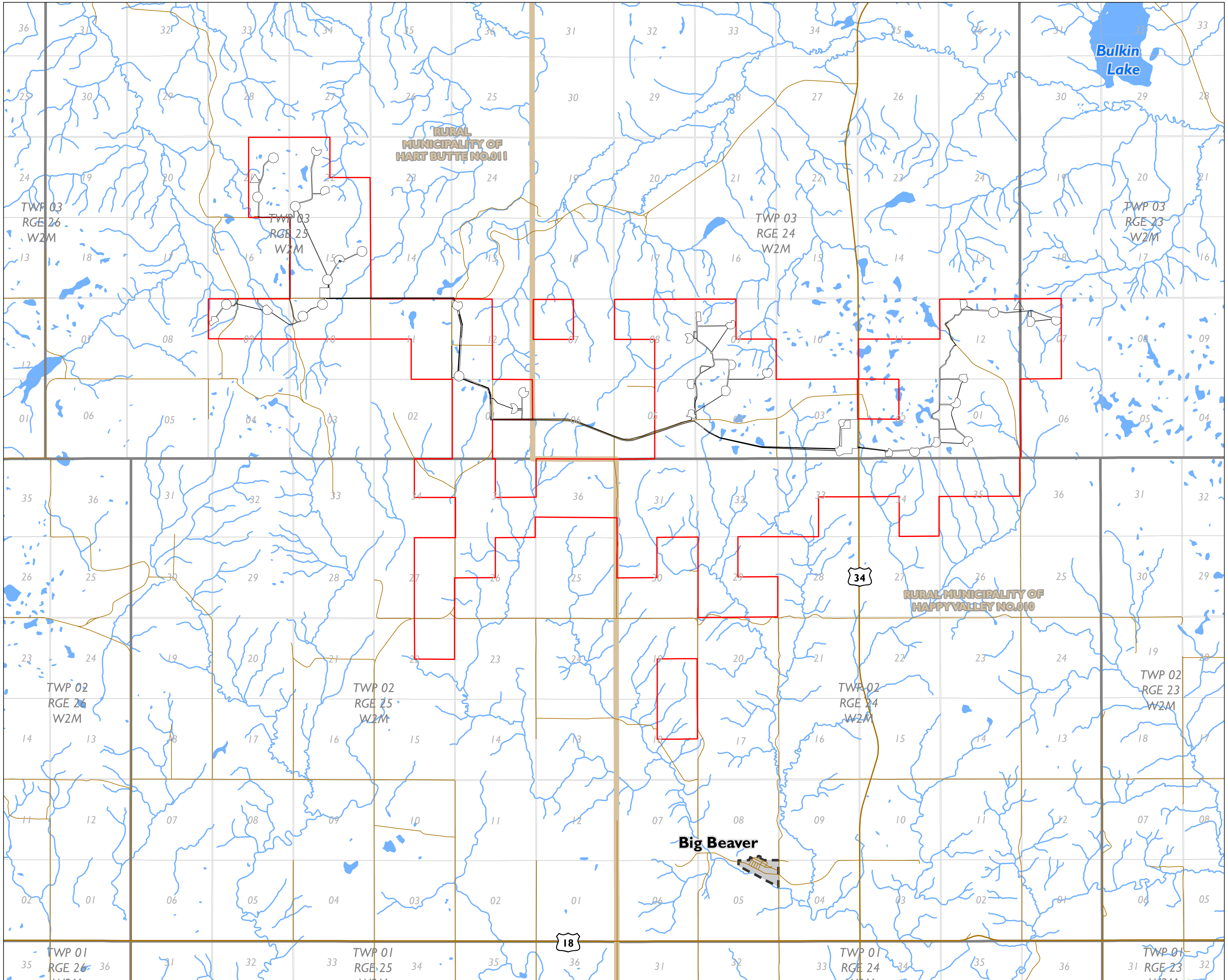
- Technical Project Proposal – Outlaw Trail Wind Energy Project (Stantec 2018), referred hereafter as the TPP;
- GIS files of the Project; and
- Subsequent email correspondence responding to information requests during the regulatory review.

On November 15, 2018, following their review of the Application, the ENV issued a Ministerial Determination to BluEarth, in which the Project was deemed a “development” as per the criteria under Section 2(d) of the *Environmental Assessment Act* (Government of Saskatchewan 1980a). As such, the Project is subject to the provincial environmental assessment (EA) requirements for a development, as described in Section 9 of the *Environmental Assessment Act*, including the preparation and submission of an EIS to the minister related to the development.

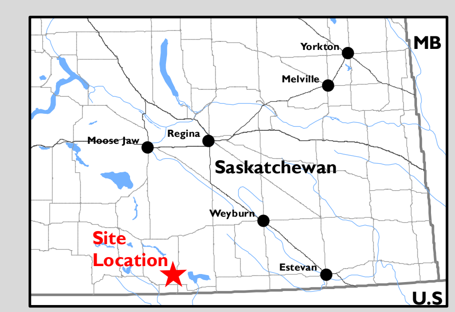
Since submitting the TPP, OTW LP has revised the Project layout and design in response to comments received during the TPP review. These changes are outlined herein for comparison to the previous layout and design. EIS is intended to fulfill the EA requirements described in the *Environmental Assessment Act*. It has been prepared in accordance with the Terms of Reference (TOR) developed for the Project and approved by ENV via email on January 29, 2020.

OUTLAW TRAIL WIND LP
OUTLAW TRAIL WIND ENERGY PROJECT

FIGURE 1-1
PROJECT LOCATION



- Project Development Area
- Project Area
- Minor Roads
- Major Roads
- Hamlet
- Rural Municipality
- Township
- Section
- Watercourse
- Waterbody



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MAP DRAWING INFORMATION:

DATA PROVIDED BY CANVEC, ESRI, GEOSASK & DILLON CONSULTING

MAP CREATED BY PH
MAP CHECKED BY CD

MAP PROJECTION: NAD 1983 UTM Zone 13N ROTATION: -0.25°

PROJECT: 191825

STATUS: FINAL

DATE: 2021-03-01

FILE LOCATION: G:\GIS\2019\191825 - Outlaw Trail Energy Project\Product\Client\EIS\Figure 1_1 Project Location.mxd

1.1 Project Overview

The Project is proposed to have a total generating capacity of up to 200 MW with a maximum of 33 WTG locations and 4 alternative locations. Each WTG will have a nameplate generating capacity of 6.2 MW. While the preliminary turbine selected for the EA is the Siemens Gamesa SG 6.0-170, the final turbine selection and number of turbines (should it be reduced from 37 locations sought for permitting in this EIS) will be determined at the time of procurement. Other permanent Project infrastructure includes access roads to each WTG, pad-mounted transformers, an above and below-ground electrical collector system, a transformer substation, communications and control system, operation and maintenance building, up to two meteorological (MET) towers and other ancillary equipment. The proposed Project Development Area (PDA) encompasses approximately 182.5 ha, a substantial reduction from the 278 ha PDA proposed in the 2018 TPP. Only 25.1 ha are expected to be occupied by permanent infrastructure compared to the 29 ha from the TPP layout. Of the 182.5 ha PDA, 157.5 ha will have light and temporary disturbance as temporary construction area.

1.2 Project Proponent

Outlaw Trail Wind LP (i.e., the Project proponent) is a joint venture entity that was formed through a partnership between BluEarth and NuWind. Details of each member of the joint venture are provided below.

1.2.1 BluEarth Renewables Inc.

BluEarth is an independent renewable energy developer specializing in the acquisition, development, construction and operation of wind, water and solar projects in Canada. The privately held corporation has headquarters in Calgary, Alberta and offices in Guelph, Ontario, North Vancouver, British Columbia and Phoenix, Arizona, USA, and employs more than 130 full-time staff.

In addition to the Outlaw Trail Wind Energy Project, BluEarth's portfolio includes the following wind energy projects:

- Bull Creek Wind Facility (in operation; 17 WTGs, 29.2 MW) near Chauvin, Alberta;
- Bow Lake Wind Facility (in operation; 36 WTGs, 58.3 MW) in Algoma district, Ontario;
- St. Columban Wind Facility (in operation; 15 WTGs, 33 MW) near London, Ontario;
- Adams Wind Facility (in operation; 12 WTGs, 19.8 MW) near Cosmos, Minnesota;
- Danielson Wind Facility (in operation; 12 WTGs, 19.8 MW) near Cosmos, Minnesota;
- Hand Hills Wind Project (in development; up to 34 WTGs and 130 MW) near Drumheller, Alberta;
- Two Rivers Wind Project (in development; up to 77 WTGs and 280 MW) near Rock River, Wyoming; and
- Luck Star Wind Project (in development; up to 200 WTGs and 500 MW) near Medicine Bow, Wyoming.

1.2.2 NuWind

NuWind is a wholly-owned subsidiary of FHQ Developments, the investment and economic development corporation for the File Hills Qu'Appelle Tribal Council, which is owned by 11 Nations.

FHQ Developments is focused on growing its economic impact in Saskatchewan through contributing to the long-term economic independence and prosperity of their Limited Partners and citizens by developing profitable business ventures, economic development opportunities, and advancing employment and livelihood for their Nations and citizens in a manner that is consistent with the Nehiyew (Cree), Dakota, Nakota, Lakota, and Anishinaabe (Saulteaux) Nations teachings.

Through the formation of OTW LP, the relationship between NuWind and BluEarth is focused on growing the participation and equity of an Indigenous business into a major renewable energy project in Saskatchewan.

1.2.3 Contact Information

OTW LP's representative for the Outlaw Trail Wind Energy Project is:

Ms. Isabelle Deguise
Regulatory and Environment Lead
Suite 440, 233 West 1st Street
North Vancouver, BC V7M 1B3
Telephone: (778)-887-8351
Email: isabelle@bluearth.ca

1.3 Regulatory Framework

In accordance with the *Environmental Assessment Act, 1980* (Government of Saskatchewan 1980a) OTW LP submitted a TPP to the ENV – EASB for the Project in 2018, following the guidelines included in *Technical Proposal Guidelines – A Guide to Assessing Projects and Preparing Proposals under the Environmental Assessment Act* (Government of Saskatchewan 2014). The TPP included a description of the Project, the conditions of the existing environment in which the Project is located, engagement activities completed to date, the potential effects of the Project on the environment, and proposed mitigation measures to reduce or avoid potential residual effects.

The TPP was submitted with the intention to inform the ENV – EASB of the Project, and facilitate the Ministerial Determination if the Project meets the criteria included in Section 2(d) of the *Environmental Assessment Act*, in which the Project would therefore be deemed a "development", and subsequently require the completion of an Environmental Impact Assessment (EIA).

Upon review the TPP, the ENV – EASB issued a Ministerial Determination to OTW LP, in which it was determined that the Project met the criteria included in Section 2(d) of the *Environmental Assessment*

Act, and is therefore considered a "development", and is required to undergo an EIA. The Ministerial Determination was based on the conclusion that the Project may:

- Have an effect on unique, rare, or endangered feature(s) of the environment; and
- Have a significant impact on the environment or necessitate a further development that is likely to have a significant impact on the environment.

In accordance with the provincial regulatory review process, OTW LP submitted a draft TOR to the ENV – EASB for review. The TOR was prepared in accordance with the *Guidelines for the Preparation of Terms of Reference* (ENV 2014a), and included an outline of the EA approach and the content of the EIS. The TOR was reviewed by the ENV – EASB, as well as an interdepartmental panel of technical experts from within the provincial government. Following their review, the ENV – EASB issued a summary of review questions, to which OTW LP addressed to the satisfaction of the ENV – EASB in a revised submission of the TOR. The finalized version of the TOR was approved via email by ENV – EASB on January 29th, 2020 (Ann Riemer. Pers. Comm. 2020), and was subsequently listed on both the ENV and BluEarth's websites. A table of concordance between the TOR and this EIS is provided in **Appendix A.**

Once an EIS is received by the ENV – EASB, a provincial EA Administrator coordinates a technical review of the EIS by an interdepartmental and intergovernmental EA review panel consisting of representatives from various provincial ministries and agencies with environmental and socioeconomic interests or responsibilities. These representatives provide multidisciplinary expertise in a range of fields to sufficiently evaluate the potential environmental effects of a proposed development (ENV 2014b).

Following sufficient review by the EA review panel, the ENV – EASB will prepare a summary of comments from the panel, with respect to the potential effects of the proposed development, the effectiveness of the proposed mitigation measures and the significance of any residual effects, as described in the EIS.

In addition to the regulatory requirements described above, the Project may be subject to other federal and provincial legislative regulatory requirements, as summarized below in **Table 1-1**.

Table 1-1: Summary of Regulatory Requirements and Approvals

Legislation/ Regulatory Agency	Description	Action Required
Federal Regulatory Requirements		
Fisheries Act, 1985, amended 2019	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.	The Project infrastructure is not proposed to interact with waterbodies or watercourses that are fish-bearing.
Migratory Birds Convention Act and Regulations, 1994	Applies to all lands where migratory birds breed and nest and prohibits the disruption or loss of active migratory bird nests. It prohibits the taking of migratory birds, their eggs or nests unless permitted.	Strategies such as timing of construction and pre-construction surveys will be utilized to avoid the disruption or loss of active migratory bird nests. OTW LP will avoid construction clearing on lands suitable for migratory bird nesting or breeding during the breeding and nesting seasons (approximately mid-April to end of August). If avoidance of this period is not possible, trained biologists will survey all lands subject to clearing prior to any activity to determine if birds are nesting within the Project construction limits. Monitoring of bird mortality as a result of Project operation will be used to determine if adaptive mitigation will be required to reduce bird mortality rates.
Species at Risk Act, 2002 (SARA)	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 of *SARA*-listed species for infrastructure siting reflect the *Saskatchewan Activity Restriction Guidelines for Sensitive Species* (ENV 2017) to avoid disturbance of SARA-listed species. Monitoring of mortality to *SARA*-listed species will occur during operation to determine if there are additional mitigation measures required to reduce or avoid impacts to SARA-listed species.

Legislation/ Regulatory Agency	Description	Action Required
Transport Canada	Responsible for ensuring proper marking and lighting on tall structures in accordance with Transport Canada's Standard 621.	An Aeronautical Assessment Form for Obstacle Marking and Lighting will be submitted to Transport Canada for their review. Approval will be required prior to construction.
Nav Canada	Responsible for issuing approval related to land use in proximity to airports.	A Land Use Submission Form will be submitted to Nav Canada for their review. Approval will be required prior to construction.
Saskatchewan Provincial Regulatory Requirements		
Environmental Management and Protection Act, 2010	Provides for the protection of aquatic habitat from development or alterations to waterbodies or watercourses.	Aquatic Habitat Protection Permits (AHPP) will be required for wetlands, streams and water bodies that may be impacted by construction activities.
Heritage Property Act, 1980	Protects and conserves heritage resources on provincial and municipal lands.	The Heritage Conservation Branch (HCB) identified lands deemed to have high heritage value in which the Project may interact with heritage resources. A heritage resource impact assessment (HRIA) was conducted on the identified lands, and the findings were submitted to the HCB for review and issuance of a clearance letter (see **Section 10.0** and **Appendix J**).
The Pest Control Act, 1978	Governs the control and destruction of certain pests, as designated by the Saskatchewan Ministry of Agriculture, such as clubroot.	Measures will be implemented to control and eradicate pests, as required, during the construction, operation and maintenance, and decommissioning phases of the Project.
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* were documented during the vegetation community surveys and will be forwarded to landowners or land occupants. Additional observations made during rare plant pre-construction surveys will also be provided to landowners or occupants.
Wildlife Act, 1998	This Act protects designated plant and animal species at risk from being disturbed, collected, harvested, captured, killed, sold or exported without a permit.	Field permits were obtained through the Fish, Wildlife and Lands Branch of ENV for the 2016 and 2017 field seasons as per the requirements in those years for field surveys completed. 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 on Crown Land within the agricultural region.	Permitting or crossing agreements may be required for any potential alteration to protected lands. Project infrastructure is not proposed to encounter any WHPA lands.

Legislation/ Regulatory Agency	Description	Action Required
The Highways and Transportation Act	This Act includes governance of the movement of loads that exceed what is normally permitted to travel on provincial roads.	An Overweight and Over-Dimensional Load Permit will be required during construction to allow the movement of trucks carrying heavy equipment and Project components on provincial roads.
Municipal Regulatory Requirements		
The Planning and Development Act, 2007	This Act allows the RMs to address land use and development issues through the adoption of an official community plan and zoning bylaw.	OTW LP has consulted with the RMs of Heart Butte and Happy Valley to determine the permits required for the Project.

1.4 Approach to Project Planning

OTW LP began advancing development activities in the Project area in 2015 following an announcement by Saskatchewan Power Corporation (SaskPower) seeking to contract Independent Power Produces (IPPs) to supply new sources of renewable energy. Prior to SaskPower's announcement, the Project area had been identified and land rights had been secured in targeted lands to develop the site for wind energy. OTW LP collected several years of wind resource data to confirm that the area was suitable for participating in a competitive wind energy procurement process.

Throughout the Project planning process, OTW LP has progressively collected more detailed information on the environment in which the Project is proposed. This information has been used to assist the siting of Project infrastructure and to facilitate the identification to the potential effects of the Project on the environment. Information was obtained by conducting studies in the Project area, engaging with individuals or groups that may have an interest or could be affected by the Project, and through ongoing discussions with regulatory agencies. Since 2015, as the regulatory landscape for wind energy projects in Saskatchewan evolved with the issuance of the several wind energy specific guidelines, OTW LP has adapted their Project to meet these guidelines and requirements.

OTW LP collected baseline environmental data for the Project through studies completed in 2015, 2016, 2017, 2019, and 2020; the results of which are considered in this EIS. This collected data was used by OTW LP in their Project planning, facility siting, development of mitigation strategies and the commitments described in this EIS. A summary of these mitigation measures and commitments is provided in **Appendix B**.

Several resources were considered during Project planning and revisions. These included:

- *Wildlife Siting Guidelines for Saskatchewan Wind Energy Projects* (ENV 2019);
- *Adaptive Management Guidelines for Saskatchewan Wind Energy Projects* (ENV 2018);
- The *Saskatchewan Activity Restriction Guidelines for Sensitive Species* (ENV 2017);
- Identified sensitive areas and features, including biophysical sensitivities e.g., native prairie and wetlands), and heritage resources;

- Alberta's *Wildlife Directive for Wind Energy Projects* (AEP 2018);
- SaskPower wind energy procurement documents; and
- The SaskPower electrical transmission grid system distribution.

1.5 Document Layout

This EIS has been organized into the following sections that focus on the required information outlined in the TOR, and to facilitate regulatory review:

- **Section 1.0 Introduction** – an overview of the Project, an introduction to the proponent and a summary of the regulatory framework within which the EIS will be completed.
- **Section 2.0 Project Description** – a description of the Project need and benefits, the Project location, considerations of Project alternatives, the components, activities and required workforce through all phases of the Project, the Project schedule, environmental management strategies and ancillary projects that may be associated with the Project.
- **Section 3.0 Engagement** – a description of the engagement program, including the program objectives, interested parties identified for included in the program, methods and tools used to engage and inform the interested parties, as well as a summary of questions and concerns received during the engagement program, and OTW LP's responses the these questions and concerns.
- **Section 4.0 Environmental Assessment Scope and Methods** – an overview of the assessment approach and methods used in the EA, and an outline of the assessment scoping, including the selection of Valued Ecosystem Components (VECs) that will be used to determine the significance of effects from the Project on the environment.
- **Section 5.0 Environmental Setting** – a general overview of the environmental setting in which the Project is located
- **Sections 6.0 to 12.0 Assessments of Potential Effects** –the assessment of potential environmental effects of the Project is organized by the VECs that were selected during scoping. The topics covered in each VEC-specific section include the scope of the assessment, a summary of existing conditions, the potential Project interactions, and evaluations of the residual and cumulative environmental effects and the determination of significance of the residual effects.
- **Section 13.0 Assessment of Potential Effects of the Environment on the Project** – an evaluation of the environmental conditions may affect the Project during construction and operation.
- **Section 14.0 Accidents and Malfunctions** – a description of potential unplanned events that may occur during the construction, operation and maintenance, and decommissioning of the Project, and an assessment of the potential environmental effects that result from these events.
- **Section 15.0 Summary and Conclusion** – an overall summary and conclusion of the EA, including the significance determined for any predicted residual effects of the Project.
- **Section 16.0 Closure** – a closing statement for the EIS.
- **Section 17.0 References** – a listing of the references and personal communications/contacts cited in the EIS.

2.0 Project Description

2.1 Project Need and Benefits

The Province of Saskatchewan has an increasing demand for power with record power usage recorded in 2017. In 2015, the Government of Saskatchewan committed to a renewable energy generating capacity increase from 25% to 50% by 2030 (Saskatchewan Chamber of Commerce 2019). This 25% increase in renewable energy would be obtained through mainly wind, solar, geothermal and biomass. SaskPower estimates power needs of 7,000 MW by 2030, with approximately 3,500 MW of this being from renewable energy, and approximately 1,050 MW (30%) being from wind power. SaskPower has initiated a procurement process where private developers design, build and commission renewable generating infrastructure, where SaskPower than purchases this renewable power from the private developer (Saskatchewan Chamber of Commerce 2019). The Project will assist in obtaining the Government of Saskatchewan and SaskPower goal of 50% renewable energy generating capacity by 2030 for the Province of Saskatchewan.

2.2 Project Location

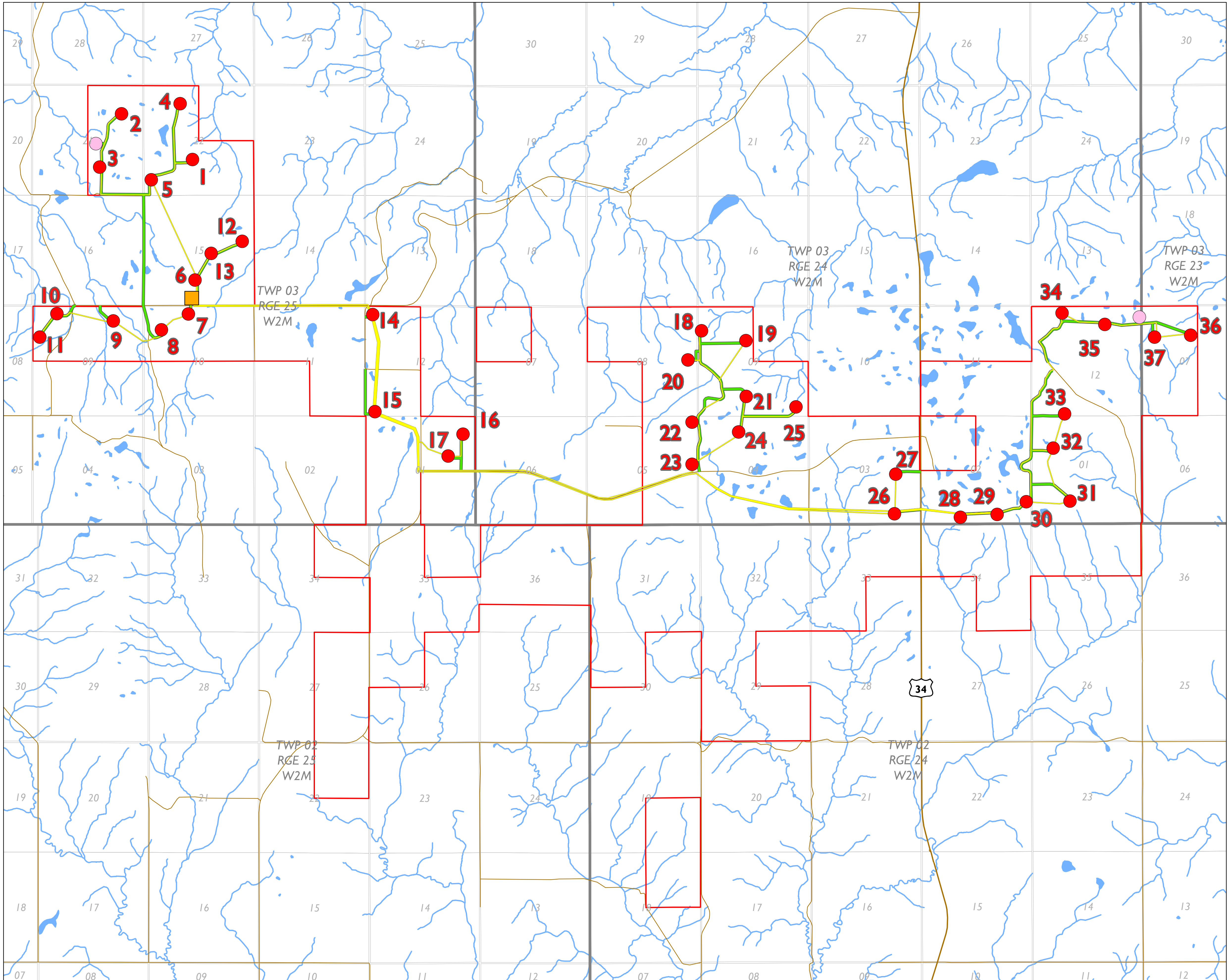
The Outlaw Trail Wind Energy Project is located in the RMs of Happy Valley and Hart Butte, approximately 5 km north of Big Beaver and 22 km south of Bengough, within Township 3 and Ranges 23, 24, and 25, West of the Second Meridian (03-23, 03-24, and 03-25 W2M) in south-central Saskatchewan. The proposed Project layout is located on private and public (municipal road right of ways [ROWs]) lands. The Project occupies land covers including primarily cultivated cropland, with pasture and a very small area of native prairie.

The Project Area is de ned as the targeted lands that OTW LP ini ally iden ed during the planning, design, and evalua on stages of the Project, as shown in **Figure 2-1**: Project Layout. The PDA was selected based on a number of factors, including but not limited to:

- Sensitive environmental features related to land cover, wildlife and heritage resources and corresponding setback distances;
- Wind resource availability;
- Community and landowner approval; and
- Construction feasibility.

The Project location was selected based on a desktop constraints analysis and associated field reconnaissance surveys completed in 2015. The desktop constraints analysis and field reconnaissance surveys identified potential environmental constraints related to sensitive environmental features including land cover, wildlife and heritage resources.

Following the issuance of *Wildlife Siting Guidelines for Saskatchewan Wind Energy Projects* (2017), the Project was revised. Additional setback distances were established through the RM of Happy Valley and Hart Butte zoning bylaws. Setback distances are further described in VEC specific sections of this EIS.

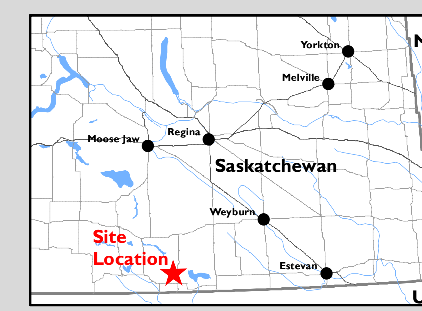


OUTLAW TRAIL WIND LP
OUTLAW TRAIL WIND ENERGY PROJECT

FIGURE 2-1
PROJECT LAYOUT

Proposed Project Layout

- Wind Turbine Generator
- Meteorological Towers
- Electrical Collector Line
- New Access Road
- Substation
- Project Area
- Minor Roads
- Major Roads
- Hamlet
- Township
- Section
- Watercourse
- Waterbody



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MAP DRAWING INFORMATION:

DATA PROVIDED BY CANVEC, ESRI, GEOSASK & DILLON CONSULTING

MAP CREATED BY PH
MAP CHECKED BY CD

MAP PROJECTION: NAD 1983 UTM Zone 13N ROTATION: -0.25°

DILLON CONSULTING

PROJECT: 191825
STATUS: FINAL
DATE: 2021-03-01

FILE LOCATION: G:\GIS\2019\191825 - Outlaw Trail Energy Project\Product\Client\EIS\Figure 2_1 Project Layout.mxd

2.3 Project Alternatives

2.3.1 Landscape Scale Alternative Project Locations

The Project site was procured by OTW LP in 2015 and evaluated for development. Based on the context of 2015 and available wind resource information, the area was identified as an ideal site and no alternative project sites were evaluated by OTW LP at the time. Site conditions at the proposed site proved to provide ideal conditions including a wind energy resource, existing land lease agreements, community and landowner support, low population densities, few known environmental sensitivities of the target lands, and proximity to the SaskPower transmission grid.

2.3.2 Alternative Project Layouts

Early alternative Project layouts underwent several iterations as regulatory guidance within Saskatchewan evolved, and to adapt in response to identified site constraints through the evaluation process. The final Project layout was based on the findings of the desktop constraints analysis and reconnaissance surveys, community and landowner input, regulatory review, available technology (e.g., turbine models) and the results of detailed field studies. Where appropriate, comparisons between the Project layout proposed in the TPP and the revised final Project layout presented in this EIS demonstrate efforts to address information provided in the Ministerial Determination.

In addition to the layout revisions from the earlier layout proposed in the TPP described above, one additional alternate layout was considered. This alternate layout was developed in response to the requirements under the 2020 SaskPower Request for Proposals (RFP) for a Wind Generation Facility to place all collector lines underground. This alternative layout included collector lines that crossed through areas of native prairie and tame pasture in four quarter sections of Crown land (NW, NE, and SE-11-03-25-W2M, and NE-10-03-25-W2M). Crossing these lands would be required because of the spacing limitations of parallel underground collector lines that could not fit within a road ROW. Despite this alternate layout having a total temporary disturbance footprint of 2.5 ha less than the final Project layout, it would result in an additional temporary disturbance of 7.5 ha of natural land cover including disturbance to an additional 7.0 ha of grassland (**Table 2-1**)**.** As such, OTW LP is proposing a layout that includes overhead collector lines through primary road ROWs to replace this section of buried collector line. However, approval for use of overhead collector lines will be required from SaskPower before construction commences. This decision to select the proposed final Project layout using overhead lines over this alternative layout was driven by the desire to reduce or avoid impacts to native prairie in every way possible. A comparison of the temporary disturbance footprint by land cover type of the proposed EIS layout against the alternate layout are provided in **Table 2-1**. The final layout resulted in a 46% reduction in the area of native grassland disturbed.

Table 2-1: Temporary Disturbance Comparison of the Proposed EIS Layout to the Alternative Layout

Land Cover Type	Final Layout (ha)	Final Layout (%)	Alternative Layout (ha)	Alternative Layout (%)
Cropland	131.2	71.9%	127.2	70.6%
Pasture/Forage	27.9	15.2%	30.8	17.1%
Grassland	8.3	4.5%	15.3	8.5%
Developed	14.1	7.7%	5.1	2.9%
Wetlands	0.7	0.4%	0.9	0.5%
Broadleaf	0.3	0.2%	0.3	0.2%
Drainage	0.1	0.0%	0.3	0.1%
Shrub	0.1	0.0%	0.2	0.1%
Total	182.5	100%	180.0	100%

*Developed includes roads, access trails, and other built areas.

2.4 Project Phases

Four phases make up the Project; development, construction, operation and maintenance, and decommissioning.

The development phase of the Project includes planning with SaskPower, environmental studies and permitting and approvals, stakeholder engagement, project design and engineering, equipment procurement and Project financing. Construction will begin when all stages of the development phase have been completed and will be dependent on selection of the Project by SaskPower, SaskPower's interconnection line, regulatory approvals, equipment supply and the seasonal conditions. The operation and maintenance phase comprises the majority of the Project lifespan, as the WTGs are anticipated to operate for a duration of 25 years (with the exception of periodic, temporary shutdowns for maintenance or during unfavourable weather). When the WTGs reach their end of operational lifespan, they may be reconditioned or replaced, otherwise the Project will be decommissioned, and the Project lands reclaimed to an acceptable pre-disturbance condition, or an alternate land capability as determined through consultation with landowners and regulatory agencies at that time.

2.5 Project Components

The equipment and infrastructure associated with regular operations of the Project are described in the following sections.

2.5.1 Wind Turbine Generators

The Project consists of the construction of 33 turbines out of a proposed 37 locations. Each WTG has approximately a 6.2 MW generating capacity for a total Project capacity of 200 MW.

The Siemens Gamesa SG6.0-170 turbine model initially selected for the Project has components including a support tower, a nacelle, a hub structure with three turbine blades and a controller. During regular operations, the WTGs have a rated capacity of 6.2MW, a cut-in wind speed of 3.0 m/s, and a cut-out wind speed of 25 m/s.

The nacelle is located at the top of the tower and contains the generator, gearbox, bearings, couplings, rotor, and auxiliary equipment. The nacelle is constructed with reinforced fiberglass and is lined with foam that helps to insulate sound and is internally ventilated with lights for safety and maintenance. The rotor blades are constructed of fiberglass and epoxy resin or carbon-fibre. The rotor has a diameter of 170 m, a blade length of 83.5 m, and a swept area of 22,698 m^2. The tower is a tubular steel structure with a hub height of 100 m and a tip height of 183.5 m. A ladder is located within the tower, which extends from ground level up to the nacelle allowing for maintenance.

Each WTG will be installed on a reinforced concrete foundation. Each foundation is anticipated to be approximately 714 m^2 in area and 2.6 m in depth; however, these dimensions are subject to change based on geotechnical evaluations of the site soil and surficial geological characteristics, wind characteristics, the final selected WTG model and site specific locations.

2.5.2 Temporary Workspace around Wind Turbine Generators

A temporary workspace will be created around each turbine to accommodate equipment and staging of the WTG components. The temporary workspace will be used for turbine foundation construction, turbine assembly, staging of equipment, parking, a crane pad, and spoil piles resulting from the foundation.

Each temporary workspace will vary in size depending on the site-specific conditions of each location, with an average temporary workspace of 30 m^2. Temporary workspaces will be designed to comply with necessary setback distances and will not be located on sensitive environmental components (i.e., native prairie, wetlands, etc.).

At Project construction completion, temporary workspaces will be returned to the pre-construction land cover with the exception of a small area surrounding the base of each WTG that allows for maintenance activities.

2.5.3 Electrical Collection System

The electrical collector system includes a transformer located at each WTG location, below-ground and above-ground collector lines installed between WTGs, and a single substation.

Collector lines

The collector lines convey power to a substation that is stepped up by the transformer located at the base of the WTG. The Project will consist of approximately 13.7 km of above-ground collector lines and 57.6 km of below-ground collector lines. When possible, these collector lines will be located in the existing road ROW and access roads to minimize further disturbance and impacts to the land. Collector lines will be installed below-ground when possible; however, due to the spacing requirement of buried collector lines when running parallel circuits, a road ROW (i.e., the ditch portion) can only hold a limited number of collector lines. As such, above-ground collector lines are able to carry more lines (i.e., phases) in this limited space. To reduce safety hazards of line strikes with equipment, above-ground collector lines will be raised where they cross field access points, and buried under municipal roads. A total of 30% of the collector lines will be located along existing and constructed road ROWs while the remainder will be located in cultivated agriculture (40%), native prairie (16%), pasture/forage (9%), and other land cover types (4%). Below-ground collector lines will be installed using the pipe-and-cable-laying ploughing (or "mole-ploughing") method, a trenchless method used to reduce land disturbance. Fibre-optic data cable and/or wireless technology will be installed alongside the under-ground collector lines to allow for 24 hour monitoring of the facility.

Substation

The substation contains switching, control, protection, communication and metering systems that support the operation. The substation receives the accumulated power from the collector lines and converts it from 34.5 kV to 230 kV. This power is then transported by SaskPower's 230 kV overhead transmission lines to a SaskPower switching station. Approvals for the SaskPower transmission line and associated infrastructure will be completed by SaskPower under a separate approval process. The substation will be located in SW-15-03-25 W2M (see **Figure 2-1**) and will occupy an area of approximately 200 m^2. It will be constructed on a raised gravel base with appropriate stormwater drainage, and a chain-link fence will be installed around the perimeter of the station, with a secured gate.

2.5.4 Temporary and Permanent Access Roads

The Project will include approximately 25.6 km of gravel access roads used to connect WTG locations and the substation. Gravel access roads will be approximately 10 m wide during the construction phase and reduced in size to 6 m wide during the regular operations and maintenance phase of the Project. Temporary access roads will result in the disturbance of 2.3 ha of native grassland; following reclamation the permanent footprint of access roads will occupy 0.5 ha of native grassland. Permanent access roads occupy cultivated agriculture (68%), existing roads (18%), pasture/forage (10%) and native prairie (4%).

2.5.5 Permanent Maintenance/Storage Facilities

The Project will include the construction of a permanent operations and maintenance building. The operations and maintenance building will be located at the site of the substation and is included within this footprint. This building will be used for general daily operations of the facility. Included in the operations and maintenance building will be a physical building, parking spaces and a storage area. The building footprint will be approximately 238 m^2, and will include a garage, office spaces, conference room, lunch room, and washrooms. A domestic use well will be installed to provide a non-potable water source for the building, and a septic system (holding tank or septic field) will be installed for sanitary waste. The septic system will be constructed in accordance with applicable regulations and guidelines. Bottled potable water will be delivered to the Project site, as required.

This operations and maintenance building will allow for 24-hour operating, monitoring and controlling of the facility. This will be accomplished through the fibre-optic data cables and wireless technology installed alongside the collector line system which will connect to the substation and the operations and maintenance building.

2.5.6 Temporary Offices and Laydown Areas

The Project includes the construction of temporary facilities to be used during the construction phase. These temporary structures will include modular maintenance, storage, office and washroom facilities that will be delivered by transport trucks to the Project site. All sanitary waste will be contained within these temporary facilities, and will be removed from the Project area by contract personnel as required. Bottled potable water will be delivered to the Project site during construction; therefore, a domestic water well will not be required during the construction phase. All temporary structures will be located on previously disturbed lands (i.e., cultivated agriculture) and removed from the site at the end of the construction phase. These areas will be reclaimed to acceptable pre-construction conditions.

Additionally, the Project will require temporary laydown areas. It is anticipated that there will be one primary temporary laydown area occupying a total of area of 16.2 ha. The laydown area will be situated on previously disturbed lands (i.e., cultivated agriculture) that will be graded and surfaced with granular material. The laydown area will be used to store materials and equipment required during the construction phase of the Project as well as host a temporary concrete batch plant to prepare concrete for foundations. Additional temporary laydown areas for each WTG will be located within the temporary workspace area of the turbine as described in **Section 2.4.2**. Temporary laydown areas will be reclaimed to pre-construction land covers at construction completion.

2.5.7 Meteorological Tower

The Project area currently operates and maintains four temporary (i.e., one 80 m high and three 60 m high) meteorological (MET) towers. The MET towers monitor various climatic parameters including wind speed and direction, air temperature and humidity. At the completion of the Project construction phase all four MET towers will be decommissioned and removed from site. Two permanent MET towers will be constructed on site to replace the four temporary MET towers. The permanent MET towers will be situated on cultivated land.

The permanent MET towers will be steel lattice structures, which would be delivered to the Project site in segments by transport trucks, and assembled on site. Each tower will be installed on a concrete foundation and supported by guywires, and will be equipped with aviation lighting in accordance with Nav Canada’s requirements. Once installed, the MET towers are anticipated to be 100 m in height, and anchored with guywires in three directions, approximately 100 m from the tower.

2.6 Project Activities

The Project activities associated with the construction, operation and maintenance, and decommissioning phases of the Project are described in the following sections.

2.6.1 Construction

Construction is the most intensive phase of the Project. The construction phase is divided into several stages detailed further below.

2.6.1.1 Site Preparation

Site preparation includes vegetation clearing, topsoil stripping, and grading of access roads, WTG locations, substation locations, temporary laydown areas, temporary workspaces and permanent facilities, as required. The temporary laydown area will be located on previous disturbed lands (i.e., cultivated agriculture). Cleared vegetation and stripped topsoil will be salvaged and stored separately in windrows for post-construction reclamation. Granular material, where required, will be obtained from a clean, local source

Approximate areas of clearing, permanent footprint, and area reclaimed are detailed in **Table 2-2**.

Table 2-2: Area of Temporary and Permanent Areas Required for the Project

Project Component	Construction Phase Area (ha)	Operation and Maintenance Phase Area (ha)	Area Reclaimed (ha)
Turbines	84.3	3.0	81.3
Access Roads	37.9	15.2	22.7
UG Collector Lines	23.3	0.0	23.3
OH Collector Lines	13.5	2.7	10.8
MET Towers	3.3	0.0	3.3
Substation	4.0	4.0	0.0
Laydown Area	16.2	0.0	16.2
Total	182.5	25.1	157.5

Temporary site preparation areas will be reclaimed to their equivalent pre-construction land use at the completion of the construction phase.

2.6.1.2 Access Roads

An access road network will be developed throughout the site to allow for access to WTG locations, substations, temporary laydown areas, temporary workspaces and permanent facilities. Access roads will be used during the construction phase to allow for the delivery and transportation of construction materials and equipment. Access roads will also be used during the operations and maintenance phase to access and perform maintenance on the facility.

When possible, access roads will aim to utilize existing municipal roads and/or develop on existing municipal road allowances (i.e., quarter section lines). Upgrades to existing municipal roads may be required (i.e., culverts, bridges, etc.) for transportation of larger and/or heavier loads. All regulatory requirements will be followed if and when in-water work is required (further detailed in the Environmental Protection Plan [EPP] in **Appendix C**). When it is not possible to develop on existing ROWs, access roads will be developed on previously disturbed lands (i.e., cultivated agriculture, existing farm trails).

Construction of access roads will involve the use of excavators, dump trucks and compaction equipment. Access roads to each individual turbine are anticipated to require one to three days of construction.

Access road construction will include surface material stripping and stockpiling. Stockpiled material will then be used during reclamation of the Project. Excess stockpiled material can be used for final grading and reclamation of the site or added to adjacent agricultural lands. Temporary access roads will be reclaimed to pre-construction land covers. Throughout the construction phase and at construction completion, municipal roads will be maintained and restored back to pre-construction states, if required. Additional guidelines and best management practices (BMPs) will be outlined in the EPP (i.e., sediment and erosion control).

2.6.1.3 Foundations

Each WTG and MET tower will be installed on a reinforced concrete foundation. Foundations will also be required to support the operation and maintenance building and areas of the substation.

The foundations will be excavated using an excavator and/or backhoe, concrete will be either prepared on site in a temporary batching plant constructed in the temporary laydown area, or prepared at an existing off site concrete facility and delivered to the Project. Trucks will deliver concrete to each location via the constructed access roads. It is anticipated that each turbine foundation will require approximately 72 truckloads of concrete. Once completed, the foundations will be required to cure for a minimum of 7 days prior to backfilling.

Foundation construction will include surface material stripping and stock piling. Stockpiled material will then be used during reclamation of the Project. Excess stockpiled material can be used for final grading and reclamation of the site or added to adjacent agricultural lands. Temporary construction areas will be reclaimed to pre-construction land covers. Additional guidelines and BMPs (i.e., sediment and erosion control) will be outlined in the EPP (see **Appendix C**).

2.6.1.4 Turbine Assembly

Turbine assembly and erection will be completed with cranes. All WTG assembly will be completed at the site of the turbine within the designated temporary workspace. Cranes will be situated on crane pads and matting and leveling will be completed, when required. Turbine assembly and erection is anticipated to take a minimum of two to four days for each WTG.

2.6.1.5 Electrical Collector Line System

The electrical collector line system will consist of below-ground and overhead collector lines. Additionally, fiber-optic communication cables will be installed alongside the electrical collector line system. Below-ground collector lines will be installed using the pipe-and-cable-laying ploughing (or "mole-ploughing") method, a trenchless method used to reduce land disturbance. Above-ground collector line systems will be strung on wooden poles, and limited to developed road allowances and to avoid sensitive environmental features, if required.

The electrical collector line system will be located on previously disturbed lands (i.e., cultivated agriculture) and within existing and constructed road access ROWs. Directional drilling will be implemented at all water and road crossings to minimize disturbance.

2.6.1.6 Operations and Maintenance Building

The operations and maintenance building will be constructed within a cleared and graded area adjacent to the substation. Excess stockpiled material can be used for final grading and reclamation surrounding the building, or blended into the adjacent agricultural lands. Temporary construction areas will be reclaimed to an acceptable pre-construction land use capability (i.e., cultivated agricultural land). Operation and maintenance building construction will require the use of excavators, dump trucks and compaction equipment.

2.6.1.7 Materials and Equipment Use

Project construction material and equipment requirements will vary based on the construction contractor's completion and construction strategy and schedule. Materials that will be needed during the construction phase include, but are not limited to:

- WTG components for assembly at each WTG location;
- Concrete and rebar for construction of reinforced foundations for the WTGs;
- Granular material for construction of access roads, WTG pads, substation and, temporary laydown area;
- Fuel, lubricants, and other fluids for operations and maintenance of equipment and machinery;
- Water for dust control and concrete mixing; and
- Electrical lines, fiber optic lines, and conduit.

Construction will involve the use of a variety of equipment and machinery, including but not limited to:

- Excavators, bulldozers, backhoes, graders, and compaction equipment for site preparation, foundation excavation, and reclamation;
- Transport trucks for delivery of Project components, materials, and equipment;
- Dump trucks for delivery and transportation of granular and excavated material during site preparation;
- Cement trucks for delivery of concrete for foundation installation;
- Batch plant (if required) for on site preparation of concrete during foundation installation;

- Cranes for loading and unloading Project components, assembly and erection of the WTGs, and installation of above-ground collector lines, substation, and operation and maintenance building;
- Light duty trucks with trailers for transportation of Project personnel and small materials and equipment;
- Secure storage containers and vessels for storage of hazardous materials (e.g., fuels) in accordance with applicable legislation; and
- Hand tools, generators, light plants, and other smaller tools and equipment for completing general labour during construction.

2.6.1.8 Hazardous Materials Storage

Hazardous materials (e.g., fuels, propane, lubricants, etc.) will be stored on site in a designated hazardous materials storage area. Fuel will be transported from the designated fuel storage area by a mobile service truck to refuel larger construction equipment located on site. All designated fuel storage areas will be located a minimum of 100 m from any waterbody. When stored onsite, fuel and hazardous materials will be stored in secure containers with appropriate containment, and the contractor will have materials to contain and recover fuel spills (i.e., spill kit) in compliance with provincial regulations including the *Environmental Management and Protection Act, 2010* (Government of Saskatchewan 2010a) and the *Environmental Management and Protection Regulations, 2015* (Government of Saskatchewan 2015).

2.6.1.9 Transportation of Components

Transportation of various material and equipment components will be completed by truck throughout the contraction phase of the Project. All turbine components and associated materials will be transported to the site by truck. The largest amount of traffic will be associated with the pouring of concrete foundations, with up to 40 truckloads of concrete being delivered to one WTG location a day. Appropriate signage will be posted and flagging person positioned on public municipal roads, as required.

2.6.1.10 Waste Management

A waste management plan will be developed and implemented by the contractor. The waste management plan will comply with applicable legislation including handling, storage, transportation and disposal processes. Construction waste will consist of both domestic and industrial waste. All waste on site will be securely stored and sorted in a designated waste storage area. This waste will be transported and disposed of in a designated landfill, controlled materials or recycling depot. The contractor will work to reduce waste to the best of their abilities and recycle when feasible. A daily waste inspection and clean-up will be performed at the end of each construction day.

Sanitary sewage will be collected in a mobile sanitary facility and collected by a permitted sewage hauler to be transported to an approved sewage disposal site where it will be properly treated and disposed of off-site.

Hazardous material and dangerous good waste will be stored, handled, transported and disposed of as per applicable legislation including the *Environmental Management and Protection Act, 2010*, guidelines and BMPs are summarized in the EPP (see **Appendix C**).

2.6.2 Operation and Maintenance

The operations and maintenance phase of the Project includes activities involving daily monitoring of the WTGs. Daily monitoring will utilize the operations and maintenance building, maintenance activities and monitoring of the meteorological data.

2.6.2.1 Turbine Operation

The Project will include up to 33 WTGs, each with a generating capacity of approximately 6.2 MW. The WTGs are designed to operate 24 hours a day, 365 days a year, over an expected Project operational period of 25 years, with the exceptions of shutdowns for unfavorable weather, operational issues and maintenance activities. Periodic shutdowns of the WTGs may occur automatically during unfavorable wind conditions (i.e., greater than 20 metres/second [m/s] or 72 kilometres/hour [km/h]) and/or ice buildup, operationally for mechanical, electrical or environmental issues including low hydraulic pressure or high generator temperature, periodically as SaskPower load requirements change, seasonally to accommodate the local economy such as crop spraying or for regular routine maintenance activities. When a WTG is automatically shut down information will be reported to the main computer system housed in the operations and maintenance building via the fibre-optic communication line.

The WTGs have a computerized control system that automatically adjust the nacelle to position facing into the wind including alteration of the blade pitch to optimize wind capture and power output. WTGs will automatically turn on at wind speeds of 3 m/s (10.8 km/h) and shut down at wind speeds greater than 72 km/h. The computerized control system can also control individual turbines where it can reduce power output, limit blade rotation, or stop blade rotation completely.

Operation of the WTGs will be in accordance with standard industry practices and will comply with the manufacturer's recommended maintenance and operations schedules to maintain warranties and achieve the expected operational life of the WTGs. WTG maintenance and servicing will be completed by a trained wind-energy technician.

2.6.2.2 Routine Maintenance

Routine maintenance on all Project components will occur at regular intervals throughout the operations and maintenance phase of the Project. Routine maintenance on the WTGs will occur at six month intervals or as specified by the manufacturer. Specific tasks will be identified and completed including, but not limited to visual inspections of mechanical components, storm water management, high voltage systems, electrical components, lubrications, oil changes and general maintenance. Routine maintenance is anticipated to take two to three technicians one day. Here technicians will service one WTG unit at a time in order to maintain a steady power supply to SaskPower.

Routine maintenance will require the storage of parts, equipment and fills on site including hydraulic hoses, electrical components, fittings, test equipment, gauges, lubricants, blades, generators and gearboxes. Additionally, vehicles such as maintenance trucks, service trucks and forklifts will be stored on site. Parts, equipment and fills will be stored in secure designated storage areas within the operations and maintenance yards. Additional equipment such as cranes may be needed for non-routine operations or maintenance and will be sub-contracted as needed.

The operating WTGs will be continuously monitored through the computer control center located in the operations and maintenance building on site as well as an off-site control center (OTW LP's Remote Operations Center located in Calgary). These systems will identify any issues with the WTGs.

All routine maintenance and operations will be followed by appropriate clean-up and disposal of materials in an approved manner. All cleanup procedures will be included in the EPP (see **Appendix C**).

2.6.2.3 Unplanned Maintenance

Unplanned maintenance will be completed on a WTG in the event of a component failure. The WTG will remain out of service until the maintenance has been completed and the component has been repaired. Unplanned maintenance will generally consist of small failures such as switches, fans and sensors. These types of unplanned maintenance activities typically can be resolved by one technician in a few hours. Unplanned maintenance of other Project infrastructure will be completed as identified through regular inspection activities.

Standard operating procedures (SOPs) supplied by the WTG manufacturer will be used during maintenance of the WTGs. These SOPs outline safety, training and contingencies for WTG equipment malfunctions and maintenance.

2.6.3 Decommissioning and Abandonment

2.6.3.1 Decommissioning

The operation and maintenance phase of the Project is anticipated to be 25 years, at which time a decision will be made whether to replace, refurbish or decommission the Project. It is likely that the WTGs will be replaced and/or refurbished at this time. However, a decommissioning plan will be in place and includes the removal of all facility components and reclaiming of the land. Decommissioning will include the use of temporary workspaces and the use of equipment to dissemble and remove the WTG and associated facilities from the site. The land will be reclaimed back to its original condition or to a condition that has been discussed and approved by the landowner and regulatory requirements at that time. The owner of the Project will be responsible for the cost of Project decommissioning.

OTW LP will develop a decommissioning plan prior to decommissioning activities. Decommissioning of the Project will follow all regulatory requirements, general environmental protection, mitigation measures and best management practices at that time. These will be outlined in the EPP and will include topics regarding but not limited to erosion and sediment control, noise management and mitigation and spills. Decommissioning practices will be similar to that of construction including the use of heavy equipment, temporary workspaces, staging areas, etc.

Decommissioning will start with de-energizing and isolating the Project from all electrical lines. All work will be completed in marked out and approved boundaries such as municipal grid roads and approved private lands. Both above-ground and below-ground collector lines will be cut, remain in place (above-ground) and/or buried (i.e., below-ground) to a minimum depth of 1 m below ground surface and/or removed as per agreements with landowners and/or the RM. Staging areas will be developed for storage of decommissioned components, geotextile and granular materials, and parking. These areas will not be excavated or graveled. WTG components including transformers and electrical substation will be dismantled by component parts to allow for removal and disposal from site. All components will be stored in the temporary staging areas until they can be removed from site via truck, using the same route used during the construction phase of the Project. All concrete foundations (i.e., foundations supporting WTGs, transformers, buildings, MET towers, etc.) will be broken and removed to a depth of 1 to 1.5 m below ground surface. Concrete, granular and geotextile materials may be stored in temporary storage areas and will be removed from the site via dump truck and disposed of or recycled off-site. All constructed access roads not situated on road ROWs will be removed (i.e., culverts, geotextile and granular materials). An access road may stay in place when requested by the landowner (e.g., upgraded access trails to crop fields) and in compliance with RM regulations. The operations and maintenance building may stay on site at the request of a landowner, otherwise it will be dismantled and removed from site as specified above for other Project components.

All materials resulting from the Project will be removed from site and disposed of or recycled in accordance with appropriate guidelines and regulations at that time.

2.6.3.2 Reclamation

The Project decommissioning plan will involve the development of a reclamation plan. The reclamation plan will be prepared by an external consultant and will comply with applicable regulatory requirements, industry standards and best management practices at that time.

Agricultural land may require deep ripping to alleviate soil compaction issues. Fill may need to be added, when required, topsoil with similar soil types and texture should be added to create a similar depth as pre-construction conditions or surrounding and neighboring lands. The site will then be contoured to match the surrounding topography and match pre-development surface drainage. The land may be cultivated and/or seeded as required based on consultation with landowners and the RM. Pasture will be seeded down to a seed mix approved by the regulators and landowner. Native prairie will be seeded down to a native prairie seed mix approved by the RM, the Saskatchewan Ministry of Highways, a native prairie restoration specialist and/or the Saskatchewan Ministry of Agriculture.

Municipal grid road allowances should experience little disturbance during the reclamation process. Infrastructure may be removed from road allowance ditches. When required, these areas will be seeded with an approved native prairie seed mix to allow for stabilization to reduce erosion. Prior to reclamation processes the client will engage with the RM to discuss required removal of infrastructure. All land will be reclaimed to pre-existing conditions or conditions approved by the RM and/or landowner. Roads constructed on road allowances will remain in place after completion of the Project.

Wetland restoration, if required, will be completed after discussions with the RM and ENV, in order to follow applicable guidelines, obtain applicable permitting, and develop site specific mitigation and remediation plans. Erosion and sediment control measures will be utilized during wetland reclamation, and will remain in place until the site has been stabilized (further details are provided in the EPP in **Appendix C**). It is not anticipated that heritage resources will be impacted by Project decommissioning as these resources would have been identified and addressed in the Project construction phase. However, prior to Project decommissioning the Saskatchewan Ministry of Parks, Culture and Sport's Heritage Conservation Branch will be consulted.

2.7 Project Workforce

2.7.1 Construction

Project construction is anticipated to require a workforce of approximately 132 construction personnel. Project construction requires a number of skills, at different training levels to carry out various activities including access road construction, foundation construction, turbine installation, electrical wiring and more. Trade employees required for the construction phase include but are not limited to pipefitters, drillers and trenchers, heavy machine operators, masonry workers, road construction and foundation excavation workers, electricians and carpenters. Additional site management and supportive roles will include the Project manager and site superintendent, project coordinator, safety coordinator, administrative positions and field engineer.

The contractor for the Project will be selected through a procurement process managed by OTW LP. Preference will be given to qualified local contractors with outsourcing for those positions that cannot be filled locally.

2.7.2 Operation and Maintenance

Project operations and maintenance will require maintenance engineers and technicians, facility manager or supervisor, and supportive administrative staff. It is anticipated that six permanent wind technician staff and one facility manager or supervisor will be employed for regular operations and maintenance of the site. Administrative staff will support the Project from BluEarth's main office.

2.8 Project Schedule

The Project is currently in the development phase, which commenced in 2015. Once all approvals are in place, construction is anticipated to last between 18 to 22 months. The targeted commercial operations date (COD) December, 2023.

A schedule of the key Project activities and milestones is present in **Table 2-3**.

Table 2-3: Anticipated Project Schedule and Milestones

Milestone	Anticipated Project Schedule
Technical Proposal Submission	July, 2018
Terms of Reference Submission	December, 2019
Environmental Impact Statement Submission	February, 2021
Environmental Impact Statement Review	February to April, 2021
Ministerial Decision	April, 2021
Municipal Permitting	April, 2021, to April, 2022
Construction	June, 2022 to November, 2023
Commissioning	December, 2023
Operation	December 2023 to 2048
Decommissioning	2048 to 2049

2.9 Human and Environmental Management Framework

OTW LP has extensive experience in the development, operations and maintenance of large scale wind energy projects where an environmental management approach and strategy will ensure the Project is compliant with regulatory requirements and best management practices implemented in order to reduce potential negative effects to the environment. OTW LP is committed to developing an environmental management framework that maintains the safety of both humans and the environment. A description of the following programs that will be implemented are described below.

2.9.1 Occupational Health and Safety

Health and safety policies and standards as well as provincial and federal health and safety legislation will be followed by on site staff at all times. The health and safety program on site will comply with the *Saskatchewan Employment Act* and *Saskatchewan Occupational Health and Safety Regulations*. The occupational health and safety plan will apply to all Project facilities, operations, employees, contractors and visitors.

During construction, the contractor will develop and maintain a site-specific health and safety plan. During Project operation, the site supervisor or superintendent will be responsible for developing and maintaining the health and safety plan. These plans will include contingencies and measures to address the potential for infectious diseases, such as COVID-19, and will consider the implications for importing labour from outside Saskatchewan as conditions require.

The health and safety plans implemented during the construction and operation phases will both include an orientation program that will provide health and safety materials and information to new employees, workers, contractors and visitors on site. Additionally, a daily tailgate meeting, hazard assessment and associated hazard controls will be completed and identified prior to any work on site. Designated first aid areas will be present throughout the site; these areas will have the equipment to provide basic first aid.

2.9.2 Emergency Response Plan

An emergency response plan will be developed and maintained for the site. The emergency response plan will be utilized in the event of a Project related emergency. In the event of a health or environment related emergency appropriate regulators will be notified.

A spill prevention and response plan will be developed and maintained on site. Any spills that occur on site will be isolated, reported and cleaned up using absorbent materials, containment berms, floating booms and/or any other required or appropriate measures.

The emergency response plan and spill prevention and response plan will be developed and maintained on site throughout the construction, operation and maintenance, and decommissioning phases of the Project.

2.9.3 Environmental Protection Plan

An EPP has been developed for the Project, which is included in **Appendix C**. The EPP outlines site-specific environmental protection practices or procedures to be implemented during each phase of the project and is based on OTW LP’s corporate commitments and regulatory requirements. The plan is comprised of three primary components: an Environmental Management Plan (EMP); an Adaptive Management Plan (AMP); and an offsetting plan.

The EMP includes management and environmental monitoring strategies to mitigate the potential effects of the Project on the environment, based on applicable regulatory requirements and accepted BMPs. The EMP also includes descriptions of the roles and responsibilities of principal parties involved in implementing the environmental protection measures the Project through construction, operation and maintenance, and decommissioning.

OTW LP is committed to implementing adaptive management processes during the operation and maintenance phase of the Project to assess the effectiveness of the environmental protection measures described in the EMP, and monitor Project operation to gain knowledge of the environmental effects of the Project, from which adaptive management decisions can be made to improve practices and reduce or eliminate these adverse effects. The AMP was prepared for the Project to describe the components of the post-construction monitoring program, including the proposed methods, analyses, reporting requirements, and mitigation strategies. The AMP is based on the ENV's *Adaptive Management Guidelines for Saskatchewan Wind Energy Projects* (ENV 2018).

The offsetting plan is intended to address the residual effects of the Project on natural land cover types that cannot otherwise be addressed through avoidance or implementation of mitigation strategies. Offsetting of residual effects to natural land cover should be considered the final option to mitigating potential effects of a Project, after avoidance and minimization the area and/or severity of effects. The EPP includes a framework to offset the residual effects of the Project on natural cover types, which was developed based on a review and inclusion of several components of recent and relevant offsetting frameworks that have been previously established. The intention of the offsetting plan is to achieve, at minimum, a net-zero balance on the landscape for each natural land cover type affected by the Project.

2.10 Ancillary Projects

2.10.1 SaskPower Interconnection

An interconnection line is required to connect the Project to SaskPower's primary transmission network. The interconnection line will run from the Project's substation to an existing SaskPower transmission line located approximately 7 km to the east of the Project. The interconnection line will be assessed as a separate project, and will be constructed, permitted, owned and operated by SaskPower.

3.0 Engagement

OTW LP is committed to the engagement and communication with stakeholders, government and regulatory agencies and Indigenous communities throughout all phases of the Project. OTW LP started engagement for the Project in 2015 and will continue to engage until the decommissioning of the Project. Engagement is a way to share information and seek feedback through comments and interest. Public engagement provides the opportunity for locals, stakeholders and other interested parties to review the Project throughout the planning and development stages of the Project. Engagement is intended to be an interactive process that allows the Project to be developed in a way that meets the developer's needs, while taking into account concerns and additional benefits to stakeholders. This is accomplished through modifications to the Project design based on responses and concerns raised during the engagement process. This section describes issues and concerns that have been raised during the engagement process and modification and/or resolutions that have been made.

The following section details the engagement process for the Project.

3.1 Objectives of the Engagement Program

OTW LP developed objectives and an approach for the engagement process that included the identification of those individuals or groups that may have an interest, have expressed interest, or could be affected by the Project. The engagement process would allow these individuals or groups to obtain information, voice their input, and review the Project throughout the planning and development phase. Engagement activities were completed through public open house events, direct stakeholder engagement and information distribution.

The objectives of the engagement process include:

- Provide opportunities to inform interested parties on wind energy projects, including construction, operation and maintenance, and decommissioning activities;
- Present potential effects of wind projects on human and natural environments;
- Provide information on the specific Project design to interested parties including location, field study results, schedule and regulatory process and requirements;
- Gather information on the Project area, as well as additional ideas, concerns and feedback that could assist in the planning of the Project;
- Provide opportunities to inform participants as to how their input and concerns will be considered in the planning of the Project;
- Discuss any modifications made to the Project design throughout the planning process; and,
- Discuss with participants how additional comments and concerns can be relayed to the developer and how further information can be obtained throughout the planning and development process.

To achieve these goals, engagement activities to date have been completed through public open house events, direct stakeholder engagement (e.g. meetings with the ENV) and information distribution (e.g. project website and mail-out newsletters).

3.2 Identification of Interested Parties

3.2.1 Stakeholders

Stakeholders were identified as local and regional individuals and organizations that may have an interest in the Project. These stakeholders are believed to be those most directly affected by the Project and who would be best to involve in influencing decisions about the Project for the greatest benefit of the community. The following initial stakeholder groups were identified:

- Residents and landowners situated within the Project area;
- Landowners located within 2 km of the Project area;
- RMs overlapping the Project area;
- Rural economic partnerships in Southern Saskatchewan;
- Villages, towns and hamlets located within 2 km of the Project area;
- Provincial regulatory agencies; and
- Non-government organizations active in the Province of Saskatchewan.

The community engagement process allowed for the identification of additional interested stakeholders. For example, during the engagement process it was identified that an organization called Big Muddy Tours offered guided tours in the area and were interested in learning more about the Project, so they were added to the contact list at that time. The stakeholder list has been continually updated throughout the planning and development process, therefore future activities will include continued identification of interested parties and outreach to them.

Non-government organizations identified as stakeholders included:

- Nature Saskatchewan;
- Saskatchewan Environmental Society;
- Ducks Unlimited Canada;
- Nature Conservancy of Canada- Saskatchewan Region;
- Canadian Parks and Wilderness Society – Saskatchewan Chapter;
- Public Pastures Public Interest (PPPI); and
- Nature Conservancy of Canada.

3.2.2 Indigenous Communities

OTW LP recognizes that the Project is located within Treaty 4 lands and acknowledges the diverse Indigenous communities that inhabit these lands. For the initial consultation process in 2017, Indigenous communities were identified based on geographic proximity to the Project and potential interest in the

Project. These Indigenous communities were identified as Wood Mountain Lakota Nation and Willow Bunch Metis Local 139. Additional Indigenous communities may be identified throughout the engagement process and therefore the list is continually updated throughout the planning and development process. The File Hills Qu'Appelle Tribal Council was also identified as representing multiple Nations including Wood Mountain Lakota Nation across the Treaty #4 territory in southern Saskatchewan.

3.3 Engagement Methods and Outcomes

Since 2015, OTW LP has been consulting and engaging with the broader Project community through active and passive approaches. Active activities include in person meetings, open houses and newsletters (see **Appendix D**), while passive approaches include keeping the project website up-to-date and providing contact information should stakeholders have any questions. OTW LP continues to use a range of engagement methods and tools throughout the planning and development process to make information accessible and provide participation opportunities and feedback for stakeholders, government agencies and Indigenous communities. The consultation and engagement activities completed to date, and those planned future activities are detailed in **Table 3-1** and the subsections below.

Table 3-1: Summary of Completed and Planned Engagement Activities

Engagement Activity	Project Stage		
	Development	Construction	Operation
Active	In person meetings Open houses Indigenous engagement Meetings with RMs Meetings with ENV Meetings with NGOs Newsletters and handouts	Community Liaison Committee In person meetings Indigenous Engagement Meetings with RMs Newsletters	Community Liaison Committee In person meetings Indigenous engagement Meetings with RMs Newsletters
Passive	Website updates Email address and phone number	Website updates Email address and phone number	Website updates Email address and phone number
Other	Tracking and Documentation		

3.3.1 In-Person Meetings

OTW LP completed phone calls and/or in person visits to landowners, municipal leaders and government ministries and organizations throughout the Project planning and development phase. The objective of this communication was to provide information and allow OTW LP to obtain specific comments and questions from particular stakeholder groups. The outcomes of these in-person meetings was to determine which individuals within the region desired to participate in the Project and to sign optioned lease agreements.

3.3.2 Open Houses

Open houses have been held throughout the Project planning and development phases. The open houses have allowed for sharing of Project information to any interested member of the public, government and regulatory agencies, Indigenous communities and non-government organizations. They have provided forums for the public to learn about the Project and Project specific planning and development activities. During the open houses, individuals were given the opportunity to ask questions and express concerns related to the Project. Comment forms were used to obtain feedback from stakeholders. Attendance was tracked through sign-in sheets at each open house. Open houses were attended by members of the Project team and local environmental consultants, who were available to answer questions, address concerns and discuss the Project.

Three open houses were held in Big Beaver, SK in June, 2016, June, 2017 and December, 2019. Open houses were communicated to the public in the region through advertisements taken out two weeks prior to the event in local newspapers, including the South Central Star and Coronach Triangle. Invitations were mailed out directly to landowners in and within 2 km of the Project area.

Further details on the content shared, feedback received and responses given at the open houses is summarized in the sections below.

3.3.2.1 Public Open House No. 1

An open house was held at the Big Beaver community hall on June 7th, 2016 between the hours of 5:30 and 8:30 pm. The open house featured various poster boards detailing the Saskatchewan government commitment to renewable energy and the upcoming wind project Request for Proposal process. Poster boards also described the Project, depicted the general Project area and described community benefits, environmental studies and post-constructing monitoring processes. The open house was attended by technical experts representing OTW LP, who were available to discuss details of the Project and respond to technical questions and concerns. Information handouts were given to attendees, as well as questionnaires that allowed alternate opportunities to provide feedback. For further details see the presented poster board content available in **Appendix D**.

A total of 21 individuals attended the public open house.

3.3.2.2 Public Open House No. 2

An open house was held at the Big Beaver community hall on June 8th, 2017 between the hours of 5:30 to 8:30 pm. The open house featured a video presentation playing on a continuous loop depicting the construction process utilized for BluEarth's Bull Creek wind energy project completed in Alberta. Poster boards depicted the layout of the 100 MW and 200 MW Project layout and described the Project phases, schedule, regulatory process, surveys and other relevant Project information. Additionally, six visual simulations for the 100 MW and 200 MW Project layout depleting before and after turbine siting from various vantage points were provided. For further details see the presented poster board content available in **Appendix D**.

A total of 9 individuals attended the public open house, including one representative of a construction company looking to obtain information regarding the construction contracting process.

3.3.2.3 Public Open House No. 3

An open house was held at the Big Beaver community hall on December 10, 2019 between the hours of 5:30 to 8:30 pm. The open house featured updates on the Project status, schedule and the SaskPower request for proposals. For further details see the presented poster board content available in **Appendix D**. The attendees at the open house were generally familiar with the Project and did not raise any new concerns about the effects of the Project.

A total of **10** individuals attended the public open house.

3.3.2.4 Summary of Public Open House Comments

A summary of stakeholder comments received at the public open houses and OTW LP's responses is provided in **Table 3-2**.

Table 3-2: Summary of Public Open House Comments

Concerns/ Comments from Individuals	Summary of Discussion	Commitments/Explanations to Address Concerns	Outstanding Concerns and Actions
Health Effects	Concern related to the potential health effects to cattle.	Provided feedback regarding experiences with cattle at other projects and the absence of concerns from cattle ranches with wind turbines on their properties.	Committed to follow-up with additional health information and material
Land Agreements	Interest in landowner compensation and possibility of including his property in project.	Explained the current proposed project layout does not require additional land. Explained at a high-level how agreements are structured but that we could not disclosed specific terms and compensations as they are confidential.	No further concerns or follow up actions

Concerns/ Comments from Individuals	Summary of Discussion	Commitments/Explanations to Address Concerns	Outstanding Concerns and Actions
Visual Impact	Concerns related to visual impact. Landowner explained that the valley is beautiful, and they wish the turbines weren't going to disturb the natural beauty. However, the landowner believes progress is good and understands why the project is moving forward.	Discussed that visual simulations were done to show the change in the landscape caused by the project (see **Appendix E)**.	No further concerns or follow up actions
Impacts to Groundwater and Soil Compaction	Concern over vibrations from the turbines causing soil compaction and impacting groundwater movement and availability in the area.	Provided documentation and research that discussed these concerns related to another wind project in Alberta. Studies demonstrate that wind projects are extremely unlikely to cause compaction resulting in issues with aquifers and groundwater.	No further concerns or follow up actions
Substation Location	Concern related to the proximity of one of the proposed substation locations and its proximity to a residence. Landowner would prefer that an alternate substation location is chosen.	Feedback was considered and that potential location was removed from consideration. This decision was communicated to the landowner.	No further concerns or follow up actions

3.3.3 Meetings with RMs of Happy Valley and Hart Butte

OTW LP has consulted with the Rural Municipalities of Hart Butte and Happy Valley throughout the planning and development process. Updates on Project planning and development were communicated to both RMs through presentations at the following RM Council meetings:

- RM of Hart Butte:
    - March 2016;
    - December 2016;
    - December 2017; and
    - February 2019; and
- RM of Happy Valley:
    - March 2016;
    - December 2017; and

  - February 2019.

In November 2019, OTW LP attended in person meetings at both RMs to provide a Project update and obtain signatures required in Form 8 – Community Engagement Checklist of SaskPower's Request for Qualifications (RFQ) RVS/155(1). Most recently in July 2020, OTW LP met with RM Councils to discuss SaskPower's RFP, provide a Project update and request written confirmation that the Project is eligible for a disposition for any road allowance under the jurisdiction and control of the RM. At this time, OTW LP obtained feedback and discussed items of interest with the municipalities, such as updated property tax estimates and use of overhead collector lines in the RM road allowance to minimize impacts to native grasslands. The RM's have since provided the written disposition for use of road allowances. OTW LP maintains regular communication with the administrator of both RMs.

3.3.4 Meetings with ENV

OTW LP has engaged and communicated with the ENV through phone calls and meetings where project updates were presented. Six engagement meetings were held between BluEarth and ENV to discuss the Project. These meetings were held on the following dates:

- June 27, 2016
- March 30, 2017
- January 18, 2018
- December 17, 2018
- April 25, 2019
- December 11, 2019

Meeting with ENV; June 27, 2016

On June 27, 2016, a meeting was held between BluEarth, Stantec, and staff from ENV. The objective of the meeting was to introduce the Project, its location, and the suite of biophysical surveys completed or planned for the assessment of environmental constraints in the Project area.

Following an introduction to BluEarth, and the Project, Stantec presented the list of surveys. A discussion ensued about the survey design and target locations identified for surveys. As well, it was stated that target locations for surveys followed the ENV protocols and focused on areas of suitable habitat. The ENV agreed with the surveys listed for completion of the Project assessment.

The ENV requested that vegetation surveys also be completed to characterize the vegetation community of the Project area. A vegetation community survey was included as part of the field studies plan and results presented in the TPP. There was also discussion of a snake hibernacula survey, as there are historical detections of snakes in the area (e.g., eastern yellow-bellied racer [*Coluber constrictor flaviventris]*, smooth greensnake [*Opheodrys vernalis*], and bullsnake [*Pituophis catenifer sayi*]). Stantec was aware of these occurrences and planned to conduct snake hibernacula surveys as pre-construction surveys when a confirmed Project infrastructure layout could focus the areas to survey.

Meeting with ENV; March 30, 2017

On March 30, 2017, a meeting took place between BluEarth, Stantec, and ENV to discuss results of surveys completed in 2016, and to re-engage ENV on the anticipated plan to develop the Project. The objective of the meeting was to discuss the implications of the ENV *Wildlife Siting Guidelines for Wind Energy Projects*, the surveys completed to date, and plans for 2017 to supplement previous surveys on additional lands included in the Project area. Following a review of the information provided about surveys completed in 2016 and those planned for 2017 and following TPP submission as pre-construction surveys, ENV requested that amphibian surveys be completed to provide a complete assessment of potential constraints prior to submitting the TPP. These surveys were completed during the spring 2017 survey program.

There was also concern about the extent of native grassland in the Project area and encouraged BluEarth to consider this land cover carefully when siting turbines and other infrastructure. As a result, no turbines or turbine temporary workspaces have been sited on native grassland.

ENV also inquired about the potential heritage sensitivity of the area, and Stantec indicated that an initial screening was completed for the preliminary Project target lands. Once the layout was received, an HCB referral would be completed to determine the need to complete a HRIA.

Meeting with ENV; January 18, 2018

On January 18, 2018, a meeting was held between BluEarth, Stantec, and staff from ENV. The objective of the meeting was to discuss the surveys completed to date, including survey points and results, regional context and plans for a 2018 regulatory submission. During the meeting the ENV expressed satisfaction with the suite of surveys completed for the Project. BluEarth also provided an update on engagement activities including stakeholder feedback to date. During the meeting the ENV confirmed that the AMP Guidelines would be finalized soon.

Meeting with ENV; December 17, 2018

On December 17, 2018, BluEarth and Stantec met with ENV to discuss the Reasons for Determination document, and ENV's comments therein, how ENV's feedback would be integrated into Project revisions, and the approach to the TOR to address the ENV's concerns, using key principles to guide future data collection and analysis.

During the meeting, the Project team provided ENV with additional information and proposed mitigation measures that would be incorporated into the EIS. Themes to guide revisions to the Project layout were also discussed with ENV, including reviewing turbine locations with reference to coulees and slope breaks, reviewing the Project location with reference to direct and indirect effects to native grassland, and micro-siting Project components with respect to wetlands. The Project team and ENV also discussed the approach to the TOR, which would be focused on the effects pathways that concerned the ENV, including effects to native grassland, plant species of management concern (SOMC), and interactions with wildlife, as well as those required for re-evaluation following changes to the

Project layout, including changes in ambient noise (i.e., acoustic environment), and cumulative effects. ENV indicated that other effects pathways will not require further analyses in the EIS.

Meeting with ENV; April 25, 2019

On April 25, 2019, BluEarth and Stantec met with ENV to present the revisions to the Project layout, describe how ENV's feedback to date had been integrated into the Project design and further discuss the approach to the TOR. During the meeting, the Project team provided ENV with an overview of the constraints to the Project design, which included the wind resource, wake effects, results of the noise assessment, landowner requirements, constructability, generating capacity and Project economics. They also provided ENV with an overview of the key changes made to the Project layout to date, and presented examples. The Ministerial Determination triggers were reviewed by the meeting attendees, and the TOR approach and information that will be subsequently included in the EIS to address the triggers was discussed.

Meeting with ENV; December 11, 2019

On December 11, 2019, BluEarth and Dillon met with ENV to discuss the draft TOR, the additional surveys completed in 2019, and the anticipated schedule for the EA and public and stakeholder engagement. During this meeting, BluEarth confirmed the revisions to the layout from the version presented in the TPP, and discussed the contents of the EIS. ENV indicated that in addition to the environmental surveys completed in 2015-2017 and 2019, that more complete evaluation of effects on heritage resources would be required for the EIS.

3.3.5 Indigenous Engagement

OTW LP continues to engage with the Wood Mountain Lakota First Nation and the Willow Bunch Métis Local 139. Information packages including Project description, Project layout and studies completed were mailed out to these Indigenous communities in 2017. Follow up phone discussions were held with the Willow Bunch Métis Local 139 in December 2017. This phone conversation included a discussion about Project location, including siting of the operations and maintenance building and the benefits to the local economy. Additionally, these Indigenous communities received invites to all open houses.

OTW LP plans to engage with other member Nations of the File Hills Qu'Appelle Tribal Council. These consultations will be completed throughout the regulatory phase of project development, through construction, and continue through the life of the Project.

FHQ Developments is the development corporation for the File Hills Qu'Appelle Tribal Council, which operates and invests in multiple companies throughout Saskatchewan. BluEarth has built a strong relationship with FHQ Developments through a common desire to partner on renewable energy-based economic opportunities, beginning when BluEarth provided studies for future solar opportunities on reserve for all 11 Nations. This relationship then turned to focusing on project specific opportunities throughout Saskatchewan for both solar and wind projects. It was in this relationship building and partnership that the opportunity to work on the Outlaw Trail Wind Energy Project came to be.

FHQ Developments is focused on growing its economic impact in Saskatchewan through contributing to the long-term economic independence and prosperity of their Limited Partners and citizens by developing profitable business ventures, economic development opportunities, and advancing employment and livelihood for their Nations and citizens in a manner that is consistent with the Nehiyew (Cree), Dakota, Nakota, Lakota, and Anishinaabe (Saulteaux) Nations teachings. This forward thinking mission allows FHQ Developments the opportunity to focus on the long term sustainability of its businesses.

The relationship that has been built between FHQ Developments through NuWind Energy and BluEarth is focused on growing the participation and equity of an Indigenous business into a major renewable energy project. This project and the equity that is to be gained through FHQ Developments will create one of the largest Indigenous equity ownerships in renewable energy in Saskatchewan. This coupled with FHQ Developments' focus on creating economic impact in Saskatchewan will see a major overall economic impact to the Saskatchewan economy and a major gain of Indigenous capacity within the industry. FHQ Developments is ensuring that there is major capacity development through every step of the way from being an equity owner to construction of the project and the maintenance of the assets over 25 years.

FHQ companies can deliver on multiple scopes of work, supply Indigenous talent from front line to management, and ensure there is significant reinvestment in the community it operates in, providing a long term, sustainable source of income and opportunity for the member Nations.

3.3.6 Non-government Organizations

OTW LP met with non-government organizations (NGOs) active in the Province of Saskatchewan. Meetings were a combination of in-person meetings and email correspondence. Results of these meetings are summarized in **Table 3-3**: Summary of NGO Meetings below.

Table 3-3: Summary of NGO Meetings

NGO	Date	Feedback Received	Project Outcome
Saskatchewan Environmental Society (SES)	Jan 28, 2020	The SES was receptive to the Project and is very supportive of renewable energy development. They were interested in the land cover disturbance of the PDA and were relieved to learn that all turbines will be located on previously disturbed land, and the area of native grassland disturbed in minimal. They expressed support for the Project.	No changes to the layout were assessed as a result of this engagement meeting.

NGO	Date	Feedback Received	Project Outcome
Nature Saskatchewan	Jan 29, 2020	Nature Saskatchewan expressed ini al concern about the poten al to disturb na ve grassland, and about the poten al impacts to the visual landscape from within the Big Muddy Valley. Following a presenta on of the layout, the PDA land cover metrics, and a presenta on of the Visual Simula on study results and photo montages (see **Appendix X**), their concerns were addressed. The result of the mee ng was general support for the Project with an encouragement to consider any other method of reducing impacts to na ve grassland.	BluEarth considered op ons for further reducing the impacts to na ve grassland, and engagement with the RMs about placing collector lines in the municipal road ROWs was started. This resulted in a revision to the layout to produce the nal layout for the EIS.
Public Pastures Public Interest (PPPI)	Jan 29, 2020	PPPI expressed ini al concerns about the Project similar to those of Nature Saskatchewan about impacts to na ve grassland and visual impacts from within the Big Muddy Valley. Following a review of the land cover within the Project footprint and visual simula ons of the Project from the Big Muddy Valley, PPPI representa ves had lesser concerns about the Project. They supported the ini a ve to try and place collector lines in the road ROWs as much as possible.	BluEarth considered op ons for further reducing the impacts to na ve grassland, and engagement with the RMs about placing collector lines in the municipal road ROWs was started. This resulted in a revision to the layout to produce the nal layout for the EIS.
Ducks Unlimited Canada	Email correspondence (Jan, 2020)	Following email correspondence with DUC and their review of the Project Loca on and land cover footprint of the Project, DUC indicated that they had no concerns to address.	No addi onal ac ons were required as a result of the consulta on.
Nature Conservancy of Canada – SK Region	To be determined	OTW LP is planning to engage with Nature Conservancy Canada following submission of the EIS as part of its ongoing engagement program.	
Canadian Parks and Wilderness Society – SK Chapter	To be determined	OTW LP is planning to engage with Canadian Parks and Wilderness Society following submission of the EIS as part of its ongoing engagement program.	

3.3.7 Community Liaison Committee

Prior to construction initiation, and as part of the community engagement program, OTW LP will develop a Community Liaison Committee (CLC). This CLC will be comprised of community leaders, community members and Project representatives from the development, construction and operations teams and will be a key venue for the community to engage and discuss Project issues. The CLC will aim to achieve the following objectives:

- To provide a forum for meaningful and open dialogue between local residents, landowners, interested parties and OTW LP on matters related to the Project construction, operation and maintenance, and decommissioning;
- For OTW LP to provide project updates on the Project construction, operation and maintenance, and decommissioning plans/activities including any ongoing studies, mitigation or monitoring activities;
- To facilitate two-way communication and help OTW LP gain a better understanding of any Project-related issues and concerns from local residents, landowners, and interested parties and to receive suggestions that can help make OTW LP a better community partner;
- For OTW LP to review, discuss and respond to comments and questions raised at the previous CLC meeting(s), emailed, or otherwise received by the CLC from members of the community;
- For CLC members to have a venue to offer constructive feedback and reasonable suggestions on local items of interest related to the Project; and
- For OTW LP to assess items brought forward or discussed at CLC meetings and incorporate them, where reasonably appropriate and at OTW LP's discretion, into the construction, operation and maintenance, and decommissioning plans/processes.

The Committee will be formed immediately upon final approval/permitting of the Project and execution of the PPA with SaskPower. Meetings of the CLC will commence prior to construction and will be held at least quarterly during construction and into early operations. This CLC will be a key avenue through which the community and stakeholders will be able to raise concerns, and also influence Project decisions.

3.3.8 Information Materials and Sources

Information handouts summarizing Project information were made available at the open houses and on the Project webpage.

Information packages detailing Project information were mailed to landowners in and within 2 km of the Project area in May 2017. These information packages included an overview of the Project and an anticipated Project schedule (see **Appendix D**).

3.3.9 Project Website and E-Mail Address

OTW LP developed a Project webpage available at:

https://bluearthrenewables.com/projects/outlaw-trail-wind-project/

The Project webpage makes Project information accessible to all interested parties. The webpage features a Project summary, preliminary layout figures, information on the open houses, Project contact information and linked to additional information. Details on the open houses include dates and content presented at the open houses including poster boards, frequently asked questions and visual simulations. Additionally OTW LP has a designated a Project specific email address (projects@bluearth.ca) and phone number (1-844-214-2578) to receive comments, feedback and answer questions related to the Project.

3.3.10 Tracking and Documentation

The engagement processes included the continuous tracking of feedback received from interested parties. Contact information was collected and documented in a database that will continue to be updated throughout the life of the Project. Additionally, issues, concerns, comments and questions have been logged and will continue to be logged to document further considerations and actions to be taken.

3.4 Future Engagement Activities

OTW LP will continue to provide multiple opportunities through various venues and methods for stakeholders, government and regulatory agencies and Indigenous communities to participate in the engagement process. Additionally, OTW LP will continue to provide information, feedback, solutions and updates made to the Project that take into account comments and concerns from the engagement process.

Future planned activities include additional open houses, the development of a community liaison committee, and ongoing identification of stakeholders, consultation and engagement with interested parties. Regular in-person meetings with landowners and other parties are planned to continue through the remainder of the development phase, and throughout the operating life of the Project. These in-person meetings will be opportunities for local residents and local government to engage with OTW LP and influence Project decisions.

Once the Project is deemed to be moving forward, a schedule for planned open houses and other meetings will be created to ensure timely distribution of information to the public and other stakeholders. This will include a stakeholder meeting following award of a Power Purchase Agreement (PPA) (summer 2021) and prior to the start of the Project construction phase (spring 2022). Additionally, an open house will be planned for local companies, contractors and individuals who are interested in working on the Project construction phase. The Project's construction contractor will participate directly in community events and hold a job fair and local vendor open house prior to construction.

4.0 Environmental Assessment Scope and Methods

4.1 Overview of the Approach

An overview of the approach and methods used to complete the EA is included in this section. The EA followed an approach that was consistent with provincial requirements, and that which was outlined in the approved TOR for the Project. The objectives of this approach are to:

- Focus on the key issues, as determined through regulatory engagement;
- Consider the concerns and feedback from the public, Indigenous communities, stakeholders, and other interested parties; and
- Incorporate mitigation strategies and engineering design in the preparation of comprehensive management plans for all phases of the Project (included in the EPP in **Appendix C**).

The focus of the EA was to identify and assess the potential effects of the Project on a selection of biophysical or socio-economical attributes of the environment, referred to in the EIS as VECs, which hold important value from a scientific, cultural, legal, economic or aesthetic perspective.

A standardized approach was used in the EA to evaluate both the Project-specific and cumulative environmental effects on each of the selected VECs, with consistent sets of tables and terminology used in each evaluation. Specific mitigation measures were applied to the Project-related environmental effects to reduce or avoid the potential effects on the VECs. Where residual Project-related environmental effects remained following the application of mitigation measures, they were characterized using a set of criteria (e.g., direction, magnitude, geographic extent, duration, frequency, and reversibility), specific to each VEC. Following characterization, the significance of the Project-specific environmental effects was determined, using a set of pre-determined criteria specific to each VEC.

The residual Project-specific environmental effects were compared to the environmental effects of other projects or developments from the past, present, or reasonably foreseeable future to determine if a spatial or temporal overlap exists between the effects. Where cumulative environmental effects were identified, these effects were evaluated to determine their significance, with consideration of the Project's contribution to them.

4.2 Scoping of the Assessment

4.2.1 Selection of Valued Ecosystem Components

The EA focused on a selection of VECs, which are identified as the biophysical or socio-economical attributes of the environment that hold important value from a scientific, cultural, legal, economic or aesthetic perspective. Further, the selected VECs have the potential to be affected by the Project and/or cumulative effects in combination with other past, present, or reasonably foreseeable future projects or developments in the region.

The following factors influenced the selection of the VECs to be incorporated into the EIS:

- Consultation with ENV following their review of the previously submitted Application for Ministerial Determination (the TPP), and the subsequent Ministerial Determination and Reasons for Determination issuances by ENV, in which their primary concerns regarding the potential environmental effects of the Project were identified;
- Concerns and feedback provided by the public, Indigenous communities, stakeholders, NGOs and other interested parties during previous and upcoming events organized as part of the engagement plan;
- Acknowledgement by ENV during follow-up meetings after their review of the previously submitted Application for Ministerial Determination, that the potential effects of the Project on several ecological components were sufficiently evaluated in the TPP, and will not require further elaboration in the EIS;
- The Project team's understanding of the existing environmental conditions within the Project's areas of assessment, and the potential interactions between the Project and the environment; and
- The Project team's understanding of best management practices, and experience in the design and implementation of effective mitigation measures on projects of similar scale and in a similar environment.

The *Guidelines for the Preparation of the Terms of Reference* (ENV 2014a) include a list of suggested VECs that may be included in the preparation of an EIS. In consideration of these, as well as the influencing factors listed above, the EIS focused and elaborated on the following seven VECs:

- Acoustic Environment
- Terrain and Soil
- Vegetation and Wetlands
- Wildlife and Wildlife Habitat
- Heritage Resources
- Employment and Economy
- Community Services and Infrastructure

During the process of selecting VECs to be included in the EIS, several other potential VECs were considered for further analyses, but it was determined that the potential environmental effects on these components would be low or negligible and could be addressed using industry best management practices and standard mitigation measures, they would be addressed through the consideration of particular interactions with another VEC, or they were sufficiently assessed to the satisfaction of ENV in the TPP. The potential VECs that will not be included in the EIS, and the rationale for this determination, are listed in **Table 4-1**.

Table 4-1: Screening Rationale for Ecological Components Excluded from Further Analysis in the EIS

Ecological Component	Rationale for Exclusion
Air Quality	The implementation of industry best management practices and standard mitigation measures during construction will reduce the degree to which air quality is affected by the Project. There are also no reported effects of operating wind turbines on air quality. Therefore, a change in air quality is expected to be negligible and Air Quality is not considered a VEC for this Project.
Geology	Foundations for each WTG are not expected to adversely affect the geology within the PDA. 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 management practices and standard mitigation measures. Therefore, Geology will not be included as a VEC for the EIS.
Groundwater	Through the implementation of industry best management practices and standard mitigation measures during construction, groundwater quality and quantity are not expected to be adversely affected by excavation and dewatering (if necessary). Groundwater flows and recharge are not expected to be altered because disturbance related to foundation construction will be highly localized and shallow, and a very small proportion of the PDA will be developed as impervious surfaces. Groundwater as it relates to wetlands is included in the Vegetation and Wetlands VEC. Therefore, Groundwater is not considered a VEC for this Project.
Surface Hydrology	It is not anticipated that the Project will directly affect surface hydrology (i.e., surface water quality or quantity), as no permanent lakes or streams are located in the PDA. Existing drainage patterns in the landscape will be maintained with the use of appropriate mitigation measures during construction (e.g., culverts installed in access roads), and standard well-established mitigation measures such as erosion control measures will be implemented; therefore, the Project is not expected to cause a change in drainage patterns and drainage areas in the Project and surrounding areas. Surface water as it relates to wetland habitat is considered in the Vegetation and Wetlands component. Therefore, Surface Hydrology will not be included as a VEC for the EIS.
Fish and Fish Habitat	No fish bearing waterbodies are encountered by the PDA or within 1 km of the PDA. As such Fish and Fish Habitat will not be included as VECs for the EIS.
Human Health and Safety	Safety of the public and that of Project personnel are very important concerns to the Project. OTW LP and its contractors will implement industry best management practices and compliance with Occupational Health and Safety Guidelines through all phases of the Project. A comprehensive Emergency Response Plan will also be prepared prior to construction and operation of the Project. In addition, Human Health and Safety will be considered in the Acoustic Environment VEC. Therefore, Human Health and Safety will not be included as a VEC.

Ecological Component	Rationale for Exclusion
Land and Resource Use	Land and Resources Use was included under Human Environment as an environmental component with the potential to be affected by the Project in the TPP. The potential effect pathways included removal of lands within the PDA from current land use objectives, and changes to land and resource use capabilities during construction, operation and maintenance, and decommissioning of the Project. Following an assessment of the potential effects and proposed mitigation strategies, the predicted residual effects were determined to have a negligible effect to the current land use within the LAA. Further, following decommissioning of the Project, all facility components would be removed and the Project lands would be reclaimed to a suitable condition to allow pre-construction land use objectives to resume, or meet other land use objectives in consultation with the landowners and regulatory agencies at that time. Therefore, Land and Resource Use will not be included as a VEC in the EIS.

4.2.2 Identification of Potential Effects, Pathways, and Measureable Parameters

Once the appropriate VEC's were selected, the potential environmental effects of the Project on each VEC were identified. The rationale for the selection of each potential environmental effect is described for each VEC, along with the pathways by which the environmental effect may occur, and the measurable parameters used to characterize and evaluate the environmental effect.

4.2.3 Identification of Assessment Boundaries

Assessment boundaries are defined as the geographic or temporal limits that are considered when assessing the potential effects of the Project and other developments on the environment. These boundaries were developed to encompass the geographic range (i.e., spatial boundaries) as well as the schedule and duration (i.e., temporal boundaries) over which the Project may interact with the VEC's.

4.2.3.1 Spatial Boundaries

The spatial boundaries defined below were developed in consideration of the physical activities and components of the Project, and the nature in which these activities and components may interact with the environment. The geographic extent over which the Project's potential environmental effects may vary for each VEC. Therefore, the spatial boundaries, as they are applied to each VEC, were further defined in their respective sections of the EIS.

- **Project Development Area (PDA):** the area comprising the Project footprint, which is the anticipated maximum area of physical disturbance associated with the construction and operation phases of the Project. The PDA includes the temporary (i.e., during construction) and permanent areas of physical disturbance, including the WTG pads, access roads, MET towers, collector lines, transformers, substation, operation and maintenance building, and temporary workspaces.

- **Local Assessment Area (LAA):** encompasses the area in which the Project-related environmental effects can be predicted or measured with a level of confidence that allows for assessment, and in which there is a reasonable expectation that those potential effects in the LAA will be a concern. The LAA encompasses the PDA, and the extent is variable, dependent on the specific VEC with which the LAA is associated.
- **Regional Assessment Area (RAA):** the area within which potential cumulative effects – the residual effects from the Project in combination with those of past, present and reasonably foreseeable projects – are assessed. The extent of the RAA encompasses both the PDA and LAA.

4.2.3.2 Temporal Boundaries

Temporal boundaries are defined by the period of time at which an environmental effect may occur, relative to the specific phases and activities associated with the Project. The temporal boundaries were based on the timing and duration of these Project phases and activities, as well as the nature of their interactions with each VEC. The temporal boundaries for assessment of the Project's residual and cumulative effects include the following phases:

- **Construction**: The anticipated duration of the construction phase is approximately 1.5 years, which includes site preparation, construction of the Project components (e.g., WTGs, access roads, collector lines, substation, operation and maintenance building), reclamation of temporary workspaces, and Project commissioning.
- **Operation and Maintenance**: The operation and maintenance phase will commence once the Project is commissioned, and is anticipated to continue for a minimum of 25 years before potential refurbishment or decommissioning may be required.
- **Decommissioning**: The decommissioning phase is anticipated to last approximately six months, which will include the removal of above-ground infrastructure, portions of the concrete foundations, access roads and WTG pads, abandonment or removal of buried collector lines, and reclamation of lands within the PDA to a condition similar to pre-development conditions, and appropriate for the future land use objectives, based on consultation with the landowners and regulatory requirements at that time.

Specific activities during the construction or operation and maintenance phases were identified if potential effects were isolated to certain activities.

4.2.4 Significance Criteria

The significance of the residual environmental effects from the Project was evaluated using rating criteria that are specifically established for each VEC. The following resources were considered in determining the significance criteria:

- Information collected through engagement and consultation with the public, Indigenous communities, stakeholders, and regulatory agencies;
- Information obtained from the TPP;
- Previous experience assessing the effects of wind energy projects;

- Knowledge of the landscape in which the Project is located; and
- Judgement of qualified professionals on the EA team.

4.3 Existing Conditions

Following the scoping of the assessment, a description of the existing (baseline) environmental conditions is provided in the EIS, including a high-level general overview of the region, and a detailed description of existing conditions specific to each of the selected VECs.

The high-level description of the existing conditions of the biophysical and socio-economic environments is included in **Section 5** of the EIS, to provide a landscape perspective of the receiving environment in which the Project is located, and to provide a basis for the evaluation of potential effects from the Project. The VEC-specific descriptions of existing environmental conditions are included in their respective sections of the EIS (i.e., **Sections 6 to 12**). These focused descriptions are presented in sufficient detail and breadth to support a thorough assessment of the potential environmental effects of the Project on the applicable VEC. The baseline data provided in the EIS allowed for trends and changing conditions in the environment to be discerned, as appropriate. The information was limited to that which is necessary to effectively assess the environmental effects of the Project, and to facilitate the development of recommendations and strategies for mitigation, monitoring, and follow-up to address these environmental effects.

Information on the existing environmental conditions was obtained from available sources (including scientific literature and online databases), field reconnaissance, biophysical field studies, and data analyses. The information that was originally compiled to support the preparation of the TPP for the Project was incorporated into the description of existing conditions for each VEC, along with additional information obtained from subsequent field studies and engagement activities. The methods and results of the data collection that are relevant to the EA are provided in the applicable sections of the EIS.

4.4 Assessment of Environmental Effects

The potential Project-specific environmental effects and subsequent cumulative environmental effects (where applicable) were assessed in consideration of the existing conditions of the selected VECs and proposed mitigation measures. A determination of significance was then made, using the predetermined significance criteria, and specific monitoring measures were proposed to evaluate the accuracy of the EA findings. The methods used in the assessment are outlined in the following sections.

4.4.1 Potential Project – Valued Ecosystem Component Interactions

The Project components and activities were considered in the context of each of the selected VECs, to identify the Project activities that could interact with the VECs through the identified effects pathways. Where complete effect pathways were identified, the Project activities that could interact with the VEC and result in an environmental effect were assigned a check mark in a matrix table that is included in each of the VEC-specific sections.

4.4.2 Assessment of Project-Related Environmental Effects

An assessment of the potential environmental effects that may result from interactions between Project activities and each VEC is included in the EIS. The assessment was completed in the context of each VEC, in consideration of the following features for each potential environmental effect:

- The pathways by which the Project may result in the potential environmental effect on the VEC;
- Application of standard and Project-specific mitigation measures (avoidance, mitigated reductions, or offsetting) or management strategies that may be proposed to reduce or eliminate the potential environmental effect;
- Identification of any resulting predicted residual effects, following the application of the proposed mitigation measures, and characterization of these effects using the significance criteria specific to each VEC; and
- Determination of the significance of each of the predicted residual effects.

The criteria used to characterize the predicted residual effects are defined in **Table 4-2**. Where possible and appropriate, the residual effects were characterized quantitatively. Where a quantitative characterization is not possible or appropriate, the effects were characterized qualitatively, using the categories defined for each applicable criterion in **Table 4-2**.

Table 4-2: Criteria for Characterization of Predicted Residual Effects of the Project on the Environment

Crite+rion	Quantitative Measurement or Qualitative Classification
Direction	**Positive** – the residual effect may result in a net beneficial change to the selected VEC, relative to the baseline conditions **Neutral** – the residual effect may result in no net change to the selected VEC, relative to baseline conditions **Adverse** – the residual effect may result in a net adverse change to the selected VEC, relative to the baseline conditions
Magnitude	**Negligible** – the residual effect may result in no detectable change to the VEC from baseline conditions **Low** – the residual effect may result in measurable changes to the VEC from baseline conditions, though the changes are anticipated to be within the range of natural variation and below applicable guideline values **Moderate** – the residual effect may result in measurable changes to the VEC from baseline conditions that are slightly beyond the range of natural variation or applicable guideline values (e.g., not measurable beyond the LAA, potentially affecting a portion of a population) **High** – the residual effect may result in measurable changes to the VEC from baseline conditions that are considerably beyond the range of natural variation or applicable guideline values (e.g., measurable effects extending beyond the LAA, potentially affecting an entire population)

Crite+rion	Quantitative Measurement or Qualitative Classification
Geographic Extent	**PDA** – the residual effects are limited to the extents of the PDA **LAA** – the residual effects are limited to the extents of the LAA **RAA** – the residual effects extend beyond the LAA and interact with other projects or activities within the RAA
Duration	**Short-term** – the residual effect is limited to the duration of the construction phase or a specific activity **Medium-term** – the residual effect extends throughout the construction and operation phases, and is reversible at decommissioning **Long-term** – the residual effect extends throughout the construction and operation and maintenance, and decommissioning phases (i.e., >25 years)
Frequency	**Single Occurrence** – the residual effect is restricted to a single, discrete period or Project activity **Periodic Occurrences** – the residual effect occurs intermittently **Continuous** – the residual effect occurs continuously
Reversibility	**Reversible** – the residual effect is likely to be reversible at some predicted period **Irreversible** – the residual effect is unlikely to be reversed and is predicted to be permanent

Where no residual effect was predicted, justification has been provided.

4.4.3 Assessment of Cumulative Environmental Effects

For the purposes of this assessment, cumulative environmental effects are defined as changes to the biophysical or socio-economic environment caused by an activity associated with other past, present, or reasonably foreseeable or publicly known future natural or human activities. The cumulative environmental effects that were assessed are those that result from the Project-specific, adverse residual effects that may interact in a cumulative manner with the potential adverse residual effects of other past, present, or reasonably foreseeable or publicly known future projects or physical activities.

The cumulative effects of past projects or activities were reflected by existing environmental conditions, to which the residual environmental effects of the Project may contribute. An assessment of cumulative effects has been included in each VEC-specific section of the EIS. Within the assessment, the past and present, natural and human activities is discussed in the context of how these activities contributed to the existing environmental conditions within each respective RAA. The Project-specific residual effects, as well as those identified from other reasonably foreseeable or publicly known future projects or activities were then considered with respect to how they may cumulatively affect each VEC relative to the existing environment within the RAA.

For the Project to cumulatively affect a VEC, the following conditions must be met:

- The Project is likely to result in adverse, residual effects to the VEC, which are specific to the Project; and

- The Project's adverse residual effects are likely to act cumulatively with the residual effects of other projects or physical activities in the RAA specific to each VEC.

These two conditions were assessed for each VEC following the assessment of Project effects. For potential effects where these conditions were not met, there was no expectation that the Project will contribute cumulatively to residual effects, and further assessment was not required. If both conditions were met, then the evaluation of cumulative effects was undertaken. This assessment also included identification of potential mitigation measures that could reduce or avoid potential cumulative effects.

A project and activity inclusion list was developed for the cumulative effects assessment (see **Table 4-3**). This list identifies other past, present and reasonably foreseeable projects and physical activities with residual effects that could overlap spatially and temporally with the Project-specific residual effects. Reasonably foreseeable projects and activities are defined as those that:

- Have been publicly announced with a defined schedule and sufficient project details that allow for a meaningful assessment;
- Are currently undergoing an environmental assessment; or
- Have been approved and are undergoing a permitting process.

A search was conducted using available information and online databases for existing and planned future projects and activities in the VEC-specific RAA with the largest extent (i.e., Employment and Economy VEC – see **Section 11.1.4**). The information search included the following sources:

- Saskatchewan Mining and Petroleum GeoAtlas (Saskatchewan Geological Survey 2020);
- Saskatchewan Environmental Assessment Interactive Map Viewer, maintained by Saskatchewan Ministry of Environment (ENV 2020);
- Canada Energy Regulator (CER) Major Applications and Projects before the CER (CER 2020); and
- SaskPower's Current Projects List (SaskPower 2020).

The projects and activities that were identified for inclusion in the cumulative effects assessment as of December 15, 2020 are presented in **Table 4-3**.

Table 4-3: Project and Activity Inclusion List

Project or Activity	Specific Project/Activity	Location	Description
Past and Present Activities and Resource Uses			
Agricultural Conversion	-	-	Historical and current agricultural conversion practices, including cultivation and seeding. Current land use in the RAA is characterized by a mixture of intensive cropland agricultural activities and range management practices. Intensive ongoing agricultural activities include ploughing, seeding, pesticide/herbicide spraying, and harvesting.
Residential Development	-	-	Historical and current use of lands for residential development.
Recreational Activities	-	-	Historical and current use of lands for recreational activities, including tourism, birding, hiking, and recreational hunting
Oil and Gas Development	-	-	Historical and current oil and gas development.
Road and Rail Development	-	-	Historical and current road (e.g., highways, gravel roads, access trails) and rail developments and maintenance activities.
Power Transmission and Distribution	-	-	Historical and current power transmission and distribution line developments.
Power Generation, Transmission, and Distribution	Poplar River Power Station	Coronach, SK	An operating 582 MW coal-fired power station owned and operated by SaskPower. It is located approximately 15 km southwest from the Project.
Resource Extraction Activities	-	-	Historical and current resource extraction activities (e.g., gravel extraction, mining).
Resource Extraction Activities	Poplar River Coal Mine	Located approximately 7 km west of the Project	The Poplar River Coal Mine is an open pit coal mine owned and operated by Westmorland Coal. Expansion of the mine was approved in 2010 and is currently ongoing.
Future Activities			
Agricultural Conversion	-	-	Agricultural (e.g., ploughing, seeding, pesticide spraying, harvesting) and range management (e.g., grazing of livestock) activities occur in rural areas throughout the RAA and is expected to continue in the future.
Residential Development	-	-	Residential development will continue within villages, towns and cities located in the RAA.

Project or Activity	Specific Project/Activity	Location	Description
Oil and Gas Development	-	-	Oil and gas exploration will continue within the RAA depending on market conditions.
Road and Rail Development	-	-	Road and rail developments and maintenance activities occur throughout the RAA and are expected to continue in the future.
Power Generation, Transmission, and Distribution	-	-	Power generation activities (e.g., electrical transmission, coal or natural gas plants, wind and solar energy facilities) occur throughout the RAA and are expected to continue in the future.
Power Generation, Transmission, and Distribution	SaskPower interconnection transmission line to connect the Project to the existing power grid	Proposed Outlaw Trail Wind Energy Project to SaskPower Switching Station	SaskPower transmission line to be built from Outlaw Trail substation to a SaskPower switching station. Location and design of transmission line and switching station are not known at the time of the TPP.
Resource Extraction Activities	Poplar River Coal Mine	Located approximately 7 km west of the Project	Open pit coal mining activity will continue into the future. The mine expansion will occur east and south of the original mine site. The ultimate build out of the mine lease area is anticipated to be complete by 2039 with a disturbance area of 1,711 ha.

4.4.4 Follow-Up and Monitoring

The follow-up and monitoring programs have been described for each VEC in the EIS. Where applicable, these programs will be required to verify the accuracy of the predicted Project-specific and cumulative residual effects or determination of significance, evaluate the effectiveness of proposed mitigation measures and determine the need for adaptive mitigation measures, and ensure compliance with regulatory requirements.

4.4.5 Effects of the Environment on the Project

While not identified as a specific VEC, the potential effects that environmental conditions may have on the Project were characterized in the EA. Environmental conditions refer to natural or anthropogenic events that may affect the normal function or stability of Project-related activities or operations, and may include severe weather events (e.g., heavy precipitation events, extreme temperatures and winds, and severe lightning), wildfires, seismic events, and events associated with the effects of climate change. The effects of these environmental conditions were assessed in the context of potential interactions with the current Project based on its current design.

Each potential effect of environmental conditions on the Project was assessed individually, which includes the identification of effect pathways, proposed measures to mitigate the effect during each Project phase (i.e., construction, operation and maintenance, and decommissioning), and characterization of residual effects. The resulting residual effects have been included in a summary, which is used to determine the significance of the potential effects of environment on the Project.

4.4.6 Accidents, Malfunctions and Unplanned Events

An assessment of the potential environmental effects of Project-related accidents, malfunctions, and other unplanned events (i.e., accidental releases of hazardous materials, failure of WTG components, ice throw, fire, and vehicle accidents) has been included in the EA. The types of accidents and malfunctions that may occur during the construction, operation and maintenance, and decommissioning phases of the Project was characterized based on a review of historical information on wind energy projects similar in scale, landscape, and/or climate region. Where the occurrence of accidents or malfunctions were identified in the historical review, the resulting effects of these events were considered in the characterization.

The characterized accidents or malfunctions were then evaluated individually to determine the effects pathways by which they may interact with any of the VECs. Proposed mitigation measures, emergency response plans, and EPPs were considered in the evaluation to identify and determine the significance of any predicted residual effects of accidents and malfunctions on the environment.

5.0 Environmental Setting

A general description of the existing landscape environmental setting in which the Project is located is included in this section. The environmental setting is described in the context of the Project Area, as depicted in **Figure 2-1**, as well as the ecoregion and landscape areas, as per Acton *et al*. (1998), within which the Project is located. Specific information regarding the environmental conditions found within the PDA, LAA, and RAA are described in **Sections 6 to 12**.

5.1 Existing Conditions

The Project is located in the Wood Mountain Plateau and Coteau Lakes Upland Landscape Areas of southwestern Saskatchewan's Mixed Grassland Ecoregion, which makes up a portion of the Prairie Ecozone. The Mixed Grassland Ecoregion comprises approximately 13% of the total area of Saskatchewan (Acton *et al*. 1998). Lying between the Moist Mixed Grassland Ecoregion and the Cypress Upland Ecoregion, the Mixed Grassland Ecoregion is considered the most arid area of the province.

The Wood Mountain Plateau Landscape Area is defined by small plateaus interspersed with a large network of gullies and creeks dominated by rangeland interspersed with agricultural cropland. This landscape area contains elevations of 800 to 850 m with gentle slopes dominated by brown soils. The Coteau Lakes Upland Landscape Area is defined by hilly hummocky morainal areas containing native prairie grasslands interspersed with agricultural cropland. This landscape area contains elevations ranging from 730 to 760 m with generally steep to very steep slopes dominated by brown soils.

The Mixed Grassland Ecoregion is characterized by a semiarid climate with a mean annual temperature of 3.5°C, with a mean temperature of 16°C in the summer and -10°C in the winter. On average, this region receives between 250 to 350 mm of precipitation. The Mixed Grassland Ecoregion is made up of Upper Cretaceous sediments and composed mainly of kettle, loamy glacial till, undulating to dissected, loamy lacustrine sediments, and hummocky sandy eolian deposits. Soils in this region are dominated by Brown Chernozems with large areas of Solonetzics. The natural vegetation in the Mixed Grassland Ecoregion is dominated by spear grasses (*Hesperostipa* spp. and *Nasella* spp.), blue grama grass (*Bouteloua gracilis*) and wheat grass *(Elymus* spp., *Leymus* spp. and *Pascopyrom* spp.) and with sub-dominate june grass (*Koeleria macrantha*) and dryland sedges (*Carex* spp.). Shrubs and herbs are also common throughout the region and are dominated by sagebrush (*Artemisia spp.*). Valleys and shaded slopes support aspen (*Populus* spp.), willow (*Salix* spp.), cottonwood (*Populus* spp.) and box-elder (*Acer negundo*). Approximately half of the land use in the Mixed Grassland Ecoregion is cultivated while the remaining half of the region is used for pasture and rangeland (University of Saskatchewan 2008).

The Project is situated in the Prairie Pothole Region (Ducks Unlimited Canada 2020). This region contains millions of shallow pothole wetlands created by the glaciers during the last ice age. These wetlands provide valuable wildlife habitat including wetland and waterfowl species, water filtration and flood and drought protection (Ducks Unlimited Canada 2020).

General conservation concerns in this region include:

- Loss, conversion and/or disturbance of native prairie grasslands;
- Loss, conversion and/or disturbance of wetlands; and
- Loss and/or degradation of wildlife and vegetation habitat through the loss of native prairie grasslands and wetlands.

Additional details on the environmental setting in the region surrounding the Project are provided below.

5.1.1 Atmospheric Environment

The atmospheric conditions within the Project region are typical of a sparsely populated, rural environment in southern Saskatchewan, which is predominately used for agricultural production. Generally, ambient air quality is considered good. Fluctuations in air quality may occur at a local scale on a seasonal basis as a result of agricultural activities in the region, such as cultivating, spraying, crop harvesting, and burning straw. Other sources that may affect air quality in the Project region include the Westmoreland Mining LLC (Westmoreland) Poplar River Coal Mine located approximately 7 km west of the Project, and SaskPower's Poplar River Thermal Coal Power Station located approximately 15 km southwest of the Project.

The nearest air quality monitoring station to the Project is an Airpointer automated station in Weyburn, Saskatchewan, approximately 103 km northeast of the Project, which is managed by the Southeast Saskatchewan Airshed Association Inc. (SESAA). Based on the SESAA 2018 Annual Report (Matrix Solutions Inc. 2018), the Air Quality Health Index Risk Rating from this station was rated between 1 and 3, or Low Risk (Government of Canada 2019) for 93.9% of its operating period.

The climate conditions in the Project Area are characteristic of a semi-arid environment. The region receives 339.3 mm of annual precipitation, on average, with the highest amounts of precipitation occurring in the late spring and early summer months, and the lowest amounts occurring during the winter months. Air temperatures in the Project region are similarly typical of a continental semi-arid climate, with hot summers and cold, dry winters, with average daily maximum temperatures ranging from -5.5°C (January) to 26.9°C (July) (ECCC 2020b).

5.1.2 Geology, Terrain, and Soils

The surficial bedrock underlying the Project is of the Ravenscrag formation (Millard 1993). This formation is comprised of lignite-bearing sand, silt, and clay deposits of the Paleocene. This bedrock formation is overlain by a thin layer of glacial till of the Saskatoon Group within the Project region; however, numerous outcrops of exposed bedrock are visible on the eroded escarpments of the Big Muddy Valley north of the Project. The Project region is predominately characterized by gentle to moderate sloped hummocky terrain that is extensively dissected by a network of gullies and coulees that provide drainage north in to the Big Muddy Valley.

Soils in the Project Area are primarily of the Chernozemic Order (SKSIS Working Group 2018). The agricultural capability of these soils range from Class 3 to Class 6, based on the Canada Land Inventory (CLI) Soil Capability Classification for Agriculture (1972), with the majority of soils within the Project region having an agricultural capability of Class 4 (i.e., severe limitations to agricultural production), due to limitations primarily associated with moisture holding capacity, adverse topography, and wind and water erosion. Additional details on terrain and soils are presented in **Section 7.**

5.1.3 Surface Water and Groundwater

The Project is located in the Missouri River Drainage Basin in Saskatchewan (Water Security Agency 2013). The Project area is well-drained, and surface water drainage primarily flows into the Big Muddy Valley north of the Project, which in turn drains southward into the Missouri River (Acton *et al*. 1998). While no major watercourses or lakes are encountered, several wetlands and watercourses exist within the Project Area (see **Section 8.0**).

Within the Mixed Grassland ecoregion, groundwater is associated with the surficial drift that overlies the bedrock, or aquifers within the sandy and silty beds of the Judith River, Bearpaw, and Eastend to Ravenscrag bedrock formations (Acton *et al*. 1998). Groundwater well data from the Water Security Agency Water Well Drillers Report Database (Water Security Agency 2020a) was reviewed to identify existing records in the vicinity of the Project. No well records were identified within the PDA. Within the Project Area, two groundwater wells were identified; these include one water test hole and one domestic water withdrawal well (**Table 5-1**).

Table 5-1: Groundwater Wells within the Project Area

Purpose	Well Use	Number of Wells	Easting[1]	Northing[1]	Land Location
Research	Water Test Hole	1	5443192	480928	NE-22-02-25-W2M
Domestic	Withdrawal	1	5446420	480941	NE-34-02-25-W2M

[1] Note: When the exact location of a well is unavailable, the Water Security Agency places the well locations in the centre of the quarter section in which is located; therefore these well locations are approximated.

5.1.4 Aquatic Resources

Based on information provided in the Hunting, Angling and Biodiversity Information Saskatchewan (HABISask, Government of Saskatchewan 2020), no fish-bearing waterbodies or watercourses are encountered in the nearby vicinity of the Project. The network of watercourses within the Project area, as shown in **Figure 2-1**, are primarily ephemeral and seasonal drainages that provide surface runoff during spring freshet and following periods of heavy precipitation.

5.1.5 Vegetation and Wetlands

The Mixed Grassland Ecoregion is comprised of a diverse landscape made up of a mosaic of undulating plains, hummocky uplands, sand dunes, bench lands, creeks, and valleys (Acton *et al*. 1998). This ecoregion is dominated by cultivated and agricultural land (62%) and native grassland (31%) (Hammermeister *et al*. 2001).

Within the Project Area, native grassland is mainly found in areas with high variability in topography (i.e., knob and kettle landforms, coulees and gullies associated with the Big Muddy Valley), where the terrain and soil conditions present severe limitations to agricultural crop production.

Wetlands within the Project Area predominately consist of isolated ephemeral, temporary and seasonal wetlands scattered throughout upland areas, ephemeral and seasonal drainages within swales of coulees and gullies and "dugouts". Dugouts are anthropogenic waterbodies created to support livestock production that often function as permanent wetlands.

There are no historical records of plant SOMC documented within the Project Area (Government of Saskatchewan 2020), excluding those recorded during the baseline field surveys for this Project. These findings have been incorporated into the effects assessment on vegetation and wetlands in this EIS (**Section 8**).

5.1.6 Wildlife

While agricultural lands may provide some elements of suitable habitat for wildlife species (e.g., food source for species that feed on agronomic crops), they generally have poor overall habitat suitability, due to the regular disturbance from agricultural activities during the breeding or nesting periods for most wildlife species. Grassland habitats (e.g., native prairie and tame pasture) provide suitable habitat for a variety of wildlife species, including upland nesting migratory birds, ungulates, rodents and reptiles. Wetlands and drainages serve as the primary habitat for waterfowl, shorebirds and amphibians; they also provide a source of water for many terrestrial species. Shrublands, while typically limited to gullies, depressions and areas of sandy soils, provide nesting habitat for tree and shrub nesting bird species, as well as thermal and escape/refuge cover for a variety of terrestrial wildlife species. Common species found in the Mixed Grassland Ecoregion include mule deer (*Odocoileus hemionus*), coyote (*Canis latrans*), Richardson's ground squirrel (*Urocitellus richardsonii*), red-tailed hawk (*Buteo jamaicensis*), western meadowlark (*Sternella neglecta*), clay-coloured sparrow (*Spizella pallida*), and boreal chorus frog (*Pseudacris maculata*).

Within the Project Area, native prairie is primarily associated with areas of variable topography (i.e., knob and kettle landforms, coulees and gullies associated with the Big Muddy Valley), which provide large tracts of contiguous habitat suitable for a variety of grassland-dependent wildlife species, including burrowing owl (*Athene cunicularia*), ferruginous hawk (*Buteo regalis*), and Sprague's pipit (*Anthus spragueii*). This habitat can also serve as wildlife movement corridors through a landscape that has been extensively modified by agricultural practices.

The northern portions of the Project Area overlap with Terrestrial Wildlife Habitat Inventory areas for six species (Hart *et al*. 1975-1983), including mule deer, white-tailed deer (*Odocoileus virginianus*), pronghorn (*Antilocapra americana*), golden eagle (*Aquila chrysaetos*), ferruginous hawk, and prairie falcon (*falco mexicanus*). The Terrestrial Wildlife Habitat Inventory was created by the Government of Saskatchewan to provide an overview of important terrestrial wildlife habitat for SOMC and game species within the agricultural regions of the province as it existed in that period. No areas of critical habitat, as defined in species recovery strategies developed by ECCC, are overlapped by the Project (Government of Saskatchewan 2020).

The Project lands do not overlap any designated wildlife conservation lands, including wind energy project avoidance zones, WHPA designated lands, Fish and Wildlife Development Fund designated lands, registered Crown Conservation Easements, or National Wildlife Areas. The nearest designated lands include WHPA designated lands, which are located along the north and east boundaries of the Project area, and one quarter-section registered as a Crown conservation Easement, which is located in the eastern portion of the Project region, though it is avoided by the Project. These designated lands are also identified as wind energy project avoidance zones.

No Important Bird Areas (IBAs) are encountered within the Project Area. The nearest IBAs to the Project are the Big Muddy Lake IBA, located approximately 7.3 km to the east, and the Willow Bunch Lake IBA, located approximately 11.1 km to the northwest.

Within the Project Area, four historical records of wildlife SOMC have been documented (Government of Saskatchewan 2020), excluding those that were recorded during the baseline field surveys for this Project, which have been incorporated into the effects assessment on wildlife and wildlife habitat in this EIS (**Section 9**). These documented species include Sprague's pipit, eastern yellow-bellied racer, and smooth greensnake (2 records). Additional details on wildlife and wildlife habitat are presented in **Section 9.**

5.1.7 Heritage Resources

The Heritage Conservation Branch (HCB) of the Saskatchewan Ministry of Parks, Culture and Sport completed a review of the initial Project lands, and identified 85 quarter sections as "heritage sensitive" and requiring a HRIA. Once the initial layout of the PDA was determined, the quarter sections on which the PDA was situated were reviewed against the results of the heritage resource review, and determined that 32 of the quarter sections identified as heritage sensitive would be encountered by the PDA and require a HRIA.

A HRIA was completed for lands overlapping the PDA, and a HCB clearance letter was obtained for the Project on November 30, 2020. Additional details on heritage resources are presented in **Section 10.**

5.1.8 Land and Resource Use

Agriculture is the dominant land use in the Project Area. Cultivated lands are used for production of annual and forage crops, while seeded pasture and native prairie are used as rangeland for livestock production. Developed lands account for a small proportion of land cover in the Project Area, which are comprised of roads and rural residential properties. The Project is located primarily on private land, with the use of municipal road corridors for portions of the Project infrastructure.

Three vertical wells are located within the Project Area, including one abandoned oil well in NE 21-03-25-W2M, one abandoned gas well in SW 35-02-25-W2M, and one abandoned stratigraphic test well in NE 10-03-25-W2M. No active or planned wells have been identified within the lands used by the Project (Saskatchewan Geological Survey 2020).

There are no designated recreation areas or named water bodies within the Project Area. The Big Muddy Valley north of the Project is a popular tourism destination for its distinct landscape features and fascinating history. The Project is located beyond of the extent of the Big Muddy Valley, and it will not impede the public from accessing the Big Muddy for recreational purposes. A visual simulation (i.e., before-after photomontages) of the Project on the landscape, including from the perspective of the Big Muddy Valley is provided in **Appendix E**. Note that these visual simulations were prepared for the previous layout proposed in the TPP, but remain current with this final layout. The turbine locations included in the visual simulation have remained the same and the turbine heights are similar.

5.1.9 Employment and Economy

The Project is located the RMs of Happy Valley (RM No. 10) and Hart Butte (RM No. 11). The population of the RM of Happy Valley was 139 in 2016, which is a 6.1% decrease from the 2011 population of 148 (Statistics Canada 2019a). The RM of Hart Butte was 252 in 2016, which is a 4.6% reduction from the 2011 population of 264 (Statistics Canada 2019b). These RM populations are exclusive of nearby communities.

No communities are located within the Project Area. The nearest communities include Big Beaver located approximately 5 km south of the Project, and Bengough located approximately 22 km to the north. The nearest major economic centre to the Project is the City of Weyburn, located approximately 102 km northeast of the Project. Additional details on employment and economy are presented in **Section 11.**

5.1.10 Community Service and Infrastructure

With the exception of infrastructure associated with agriculture, there is no other active industrial infrastructure located within the Project Area. The nearest electrical transmission infrastructure is the SaskPower P2C 230 kV transmission line, which extends northeast from the Poplar River Power Station to the Condie switching station near Regina, Saskatchewan. The nearest point of this transmission line to the Project Area is approximately 2.4 km northwest of the most northwestern extent of the Project. Within the Project Area, a network of electrical distribution lines exists, through which power is provided to rural residences throughout the region.

Provincial Highway No. 34 extends through the eastern portion of the Project Area. Several additional publicly accessible roads exist within the Project area; however, none are identified as numbered provincial roadways. Additional details on community services and agriculture are presented in **Section 12.**

6.0 Assessment of Potential Effects on Acoustic Environment

The acoustic environment refers to the type and intensity of sound that can be detected by one or more receptors. For the purpose of the EIS, the acoustic environment VEC pertains to sounds perceived by human receptors. Sounds perceived by wildlife receptors are assessed in the wildlife and wildlife habitat VEC, specifically under sensory disturbance (see **Section 9.0**).

The acoustic environment is included as a VEC in the EIS, as there is potential for the Project to adversely affect the existing acoustic environment during the construction, operation and maintenance, and decommissioning phases of the Project. Specifically, noise generated by the Project may result in unwanted sounds perceived by homeowners in the vicinity of the Project.

A Noise Impact Assessment (NIA) was completed for the Project in 2018, which was included as an attachment to the TPP; however, the Project has since been revised, including the proposed WTG model, as well as the number and locations of the proposed WTGs. Therefore, a second NIA was completed in 2020 based on the current Project design. A summary of the results of the NIA is provided in the sections below, and a copy of the NIA is provided in **Appendix F**.

6.1 Scope of Assessment

6.1.1 Regulatory and Policy Setting

Currently, the Government of Saskatchewan does not have any standards or guidelines specific to the acoustic environment. As such, the acoustic environment was assessed using the specific guidelines for wind energy projects set forth by the Alberta Utilities Commission (AUC) under Rule 012: Noise Control (AUC 2019). These comprehensive guidelines are used to determine the thresholds for significant adverse effects to the acoustic environment within the spatial boundaries specific to this VEC, and will apply permissible sound levels within the guidance.

6.1.2 Consideration of Issues Raised During Consultation and Engagement

No concerns related to the acoustic environment were raised during OTW LP's consultation and engagement with stakeholders, regulators, landowners and Indigenous communities.

6.1.3 Potential Effects, Pathways and Measureable Parameters

The primary issues and concerns that were considered in the effects assessment are potential changes to the existing acoustic environment as a result of Project activities. The effect pathway and parameters by which a change in the existing acoustic environment can be measured are provided below in **Table 6-1**.

Table 6-1: Potential Effects, Pathways and Measurable Parameters for the Acoustic Environment

Potential Effect	Effect Pathway	Measurable Parameters
Change in the existing acoustic environment	Noise emissions associated with Project activities may result in disturbance to human noise receptors	Energy Equivalent Sound Level (LEQ), expressed in A-weighted decibels (dBA) over a specified time period.

6.1.4 Boundaries

6.1.4.1 Spatial Boundaries

The spatial boundaries used to assess the potential effects of the Project on the acoustic environment are provided below in **Table 6-2**.

Table 6-2: Spatial Boundaries for the Acoustic Environment Effects Assessment

Spatial Boundary	Boundary Description
Project Development Area (PDA)	Includes the Project footprint, which is the anticipated maximum area of physical disturbance associated with the construction and operation phases of the Project. The PDA includes the temporary (i.e., during construction) and permanent areas of physical disturbance.
Local Assessment Area (LAA)	The LAA is defined as the PDA and an area extending 1.5 km beyond the PDA boundary. This boundary is based on the criteria outlined in AUC Rule 012 (AUC 2019), in which a noise-sensitive receptor is defined as a permanent or seasonally occupied dwelling within 1.5 km of a facility, or in the case of wind energy projects, 1.5 km from the base of a turbine.
Regional Assessment Area (RAA)	A RAA was not considered in the NIA. Rather, according to AUC Rule 012, a cumulative effects assessment was conducted by considering the noise emissions from other third party existing and approved facilities that may cumulatively contribute to changes in the acoustic environment for receptors beyond the LAA boundary.

6.1.4.2 Temporal Boundaries

The temporal boundaries considered for the acoustic environment assessment are based on the duration of each phase of the Project, as described below in **Table 6-3**.

Table 6-3: Temporal Boundaries for the Acoustic Environment Effects Assessment

Project Phase	Description
Construc on	The anticipated duration of the construction phase is approximately 1.5 years, which includes site preparation, construction of the Project components (e.g., WTGs, access roads, collector lines, substation, operation and maintenance building), reclamation of temporary workspaces, and Project commissioning.

Project Phase	Description
Opera ons and Maintenance	The operation and maintenance phase will commence once the Project is commissioned, and is anticipated to continue for a minimum of 25 years before potential refurbishment or decommissioning may be required.
Decommissioning	The decommissioning phase is anticipated to last approximately six months, which will include the removal of above-ground infrastructure, portions of the concrete foundations, access roads and WTG pads, abandonment of buried collector lines, and reclamation of lands (including soils) within the PDA to a condition similar to pre-development conditions, and appropriate for the future land use objectives, based on consultation with the landowners and regulatory requirements at that time.

6.1.5 Residual Effects Characterization

The residual effects on the acoustic environment are characterized using the terms and criteria that are summarized in **Table 6-4**.

Table 6-4: Criteria for Characterization of Residual Effects of the Project on the Acoustic Environment

Criterion	Description	Quantitative Measures or Definition of Qualitative Categories
Direction	The long-term trend of the residual effect on the acoustic environment	**Positive:** a residual effect that results in changes to the measureable parameters in a direction that is beneficial the acoustic environment relative to baseline conditions. **Adverse:** a residual effect that results in changes to the measureable parameters in a direction that is detrimental to the acoustic environment relative to baseline conditions. **Neutral:** a residual effect that results in no net changes to the measureable parameters for the acoustic environment relative to baseline conditions.
Magnitude	The degree of change in measurable parameters of the acoustic environment in comparison to existing conditions	**Negligible:** no measurable change in the acoustic environment from baseline conditions. **Low:** a residual effect may be detectable, but the degree of change is anticipated to be below guideline values. **High:** a measurable residual effect on the acoustic environment that exceeds guideline values at one or more noise-sensitive receptor.

Criterion	Description	Quantitative Measures or Definition of Qualitative Categories
Geographic Extent	The geographic area in which changes to the acoustic environment may occur	**PDA:** effects are limited to the extent of the PDA. **LAA:** effects extend beyond the PDA into the LAA
Duration	The period of time required until the measurable parameters of effects to the acoustic environment return to existing conditions, or the effect can no longer be measured	**Short-term:** a residual effect is limited to a specific Project activity. **Medium-term:** a residual effect extends throughout construction and up to 10 years into maintenance and operation of the Project, or the effect only extends throughout maintenance and operation. **Long-term:** a residual effect extends through all phases of the Project until the completion of decommissioning. **Permanent:** a residual effect extends beyond Project decommissioning, and is unlikely to recover.
Frequency	Number of occurrences of a residual effect over a period of time	**Single event:** a residual effect occurs only once throughout the assessed duration. **Multiple irregular events:** event occurs sporadically and/or intermittently. **Multiple regular events:** event occurs repeatedly and/or regularly. **Continuous:** event occurs continuously**.**
Reversibility	The likelihood of a changed measureable parameter of a residual effect to return to a baseline condition upon cessation or completion of a Project phase or activity	**Reversible:** a residual effect will return to a baseline condition at a predicted period through active management and mitigation. **Irreversible:** a residual effect is permanent or unlikely to return to baseline condition for the foreseeable future.

6.1.6 Significance Definition

A determination of significance is assigned to the residual effects the acoustic environment that remain after mitigation measures have been implemented. A residual effect is considered significant where noise generated by the Project operation exceeds Permissible Sound Level (PSL) limits at one or more of the identified noise-sensitive receptors within the LAA.

6.2 Existing Conditions for Acoustic Environment

The existing acoustic environment conditions were determined through a NIA conducted by RWDI Inc. A copy of the NIA report is provided in **Appendix F**, and the methods and results are summarized in the sections below.

6.2.1 Methods

According to the AUC Rule 012 guidelines (AUC 2019), the existing acoustic environment condition is defined as the ambient sound level (ASL) at each noise receptor. The ASL is based on the Basic Sound Level (BSL), which may vary for each receptor location, and is dependent on several factors, including proximity to transportation infrastructure, dwelling density per quarter section, and time of day (i.e., nighttime versus daytime).

Noise receptors (i.e., permanent and seasonally occupied dwellings) were identified within the LAA using a combined approach that included a desktop review of mapping and imagery to identify structures and field reconnaissance to confirm occupancy (see **Appendix F, Figure 1**). Once the receptors were identified, the applicable sound level limits (i.e., PSL) was calculated for each receptor, which included a nighttime PSL and daytime PSL, based on the criteria provided in the AUC Rule 012 guidelines, with nighttime defined as the period between 10:00 pm and 7:00 am. The PSLs are used to define the thresholds of compliance to the AUC Rule 012 guidelines (AUC 2019).

The desktop review and field reconnaissance also searched for typical third-party facilities within 1.5 km of the identified noise receptors that may contribute to a cumulative effect with sound emissions associated with the Project, and would therefore be included in the NIA.

6.2.2 Results

During the desktop review and field reconnaissance, RWDI identified five noise receptors within the LAA, all of which are rural residences located at least 500 m from heavily travelled transportation infrastructure and a dwelling density less than 8 dwellings per quarter section. Further, no third party facilities that could represent noise sources were identified within the LAA. Based on these criteria and according to the AUC Rule 012 guidelines (AUC 2019), the BSL for all receptors is identified at 40 dBA, while the nighttime ASL is defined as 5 dBA less than the BSL, and the daytime ASL is defined as the nighttime ASL plus a daytime correction of 10 dBA. Therefore, for all receptors, the nighttime ASL is 35 dBA and the daytime ASL is 45 dBA.

The PSL is defined as the BSL, plus any applicable adjustments such as a daytime correction. Therefore, for all receptors, the nighttime PSL is 40 dBA, and the daytime PSL is 50 dBA. A detailed description of sound level calculations is provided in the NIA report attached in **Appendix F**.

6.3 Project Interactions with Acoustic Environment

A summary of the interactions between specific Project activities and the acoustic environment VEC, and the potential effects that may result from these interactions, are identified below in **Table 6-5**.

Table 6-5: Summary of Project Interactions with the Acoustic Environment

Project Activities	Environmental Effects: Change in Existing Acoustic Environment
Construction Phase (see commentary below)	
Site preparation, including vegetation clearing, topsoil stripping, grading and development of WTG locations, MET tower locations, access roads, substation and temporary workspaces	-
Installation of WTG and MET tower foundations; erection of WTGs and MET towers	-
Installation of collector lines and substation infrastructure	-
Post-construction reclamation of temporary workspaces	-
Operation and Maintenance Phase	
Operation and use of WTGs, MET towers, substation and access roads	✓
Routine and unplanned maintenance of WTGs and substation infrastructure	-
Routine and unplanned maintenance of collector lines, substation infrastructure and access roads	-
Decommissioning Phase	
Dismantling and removal or Project infrastructure, including WTGs, collector lines, substation infrastructure and access roads	-
Site reclamation	-

Note: ✓ denotes a potential interaction; – denotes no interaction.

Noise emissions are expected to occur during the construction phase of the Project; however, these emissions will occur sporadically and will be geographically localized, depending on the specific construction activities (i.e., road construction), and cannot be effectively quantitatively assessed. These emissions will be managed through the implementation of industry BMPs, such as restricting daily work hours where practical, notifying nearby residents in advance of activities that may emit high noise levels, and ensuring that all internal combustion engines used on the Project are equipped with appropriate muffler systems. Therefore, the effects on the acoustic environment during the construction phase are not carried forward in the effects assessment.

Maintenance activities may also result in noise emissions; however these activities will be similarly infrequent and localized, and can be managed through the implementation of industry BMPs. As such, the effects on the acoustic environment during maintenance activities are not carried forward in the effects assessment.

Noise emissions during the decommissioning phase are expected to be similar to those during the construction phase, which can be managed through the implementation of industry BMPs. Therefore, the effects on the acoustic environment during the decommissioning phase are not carried forward in the effects assessment.

As part of the mitigation for noise impacts to the acoustic environment during construction and decommissioning, OTW LP will establish open communication with local residents to address concerns or issues related to noise from Project activities.

6.4 Assessment of Residual Environmental Effects on Acoustic Environment

6.4.1 Analytical Assessment Techniques

Noise modelling was used to assess the potential effects of noise emissions associated with the Project on the existing acoustic environment during operation, in accordance with the methods provided in the AUC Rule 012 guidelines (AUC 2019). The sources of noise emissions were identified for the Project, which included 37 WTGs and one main power transformer located at the substation. The predicted sound power levels for the WTGs and transformer were derived from the specifications provided by the vendors.

RWDI then used sound level prediction software (i.e., CadnaA, Version 2020 MR1 build 181.5100) to model the cumulative sound emissions from the Project, and predict the resulting sound levels at each noise receptor. Finally, these sound levels were compared to the calculated PSLs to determine if the results indicate compliance with the AUC Rule 012 guidelines (AUC 2019).

The assessment techniques are described in detail in the NIA report attached to **Appendix F**.

6.4.2 Change in Existing Acoustic Environment

6.4.2.1 Effect Pathways

Operation and Maintenance Phase

Changes to the existing acoustic environment within the LAA may occur as a result of noise emissions from the WTGs and substation infrastructure during normal operation.

6.4.2.2 Mitigation Measures

Mitigation strategies to reduce or avoid changes to the acoustic environment were considered and implemented during the Project design and siting, to ensure noise-emitting Project components will be located an acceptable distance from existing receptors. This avoidance mitigation occurred through an iterative process of assessing noise levels at receptors from the initial turbine layout, then where necessary, adjusting the turbine locations to meet AUC Rule 007 compliance levels for all turbines.

Mitigation measures to reduce or avoid changes to the acoustic environment are provided in detail in the EPP in **Appendix C.**

6.4.2.3 Predicted Residual Effects

Based on the results of the NIA, the predicted Project-related contributions to the acoustic environment will be compliant with the daytime and nighttime PSLs at each noise receptor. The predicted sound levels and compliance determination for each receptor location are provided below in **Table 6-6** and **Table 6-7**.

Table 6-6: Assessment of Compliance with Daytime Permissible Sound Levels

Receptor ID	Ambient Sound Level[1] (dBA)	Predicted Project Sound Contribution[2] (dBA)	Cumulative Sound Level (dBA)[3]	Daytime Permissible Sound Level[1] (dBA)	Compliance with AUC Rule 012
R01	45	36.4	45.6	50	Yes
R02	45	28.4	45.1	50	Yes
R06	45	35.3	45.4	50	Yes
R07	45	35.4	45.5	50	Yes
R10	45	33.9	45.3	50	Yes

Note: [1] Calculated using the methods included in AUC Rule 012 (AUC 2019).
[2] Calculated using the sound power levels provided by the vendor specifications.
[3] The cumulative sound level is the logarithmic sum of the ambient sound level and project sound contribution.

Table 6-7: Assessment of Compliance with Nighttime Permissible Sound Levels

Receptor ID	Ambient Sound Level[1] (dBA)	Predicted Project Sound Contribution[2] (dBA)	Cumulative Sound Level (dBA)[3]	Nighttime Permissible Sound Level[1] (dBA)	Compliance with AUC Rule 012
R01	35	36.4	38.8	40	Yes
R02	35	28.4	35.9	40	Yes
R06	35	35.3	38.2	40	Yes
R07	35	35.4	38.2	40	Yes
R10	35	33.9	37.5	40	Yes

Note: [1] Calculated using the methods included in AUC Rule 012 (AUC 2019).
[2] Calculated using the sound power levels provided by the vendor specifications.
[3] The cumulative sound level is the logarithmic sum of the ambient sound level and project sound contribution.

Based on the Project design and proposed locations of Project components, the potential residual effects on the existing acoustic environment during operation are characterized below in **Table 6-8**.

Table 6-8: Characterization of Residual Effects on the Acoustic Environment during Project Operation and Maintenance

Criterion	Measure	Description
Direction	Adverse	Changes to the existing acoustic environment are anticipated to occur during Project operation
Magnitude	Low	The predicted Project noise emissions are below the PSLs at each identified receptor within the LAA
Geographical Extent	LAA	Changes to the existing acoustic environment will be limited to the LAA
Duration	Medium-term	Changes to the acoustic environment will extend throughout the operation and maintenance phase
Frequency	Multiple irregular events	Changes to the acoustic environment will occur sporadically based on the operating frequency of the WTGs
Reversibility	Reversible	Changes to the acoustic environment will be reversed following the cessation of Project operation

6.5 Assessment of Cumulative Environmental Effects on Acoustic Environment

The NIA included a search for typical third-party facilities within 1.5 km of the identified noise receptors that may contribute to a cumulative effect with sound emissions associated with the Project. The search identified no third-party facilities that may potentially act cumulatively with the Project-related sounds; however, there were abandoned wells identified in the area, which no significant noise sources are anticipated. Therefore, no cumulative environmental effects on the acoustic environment are anticipated to occur following Project development.

6.6 Determination of Significance

6.6.1 Significance of Project Residual Effects

Based on the findings of the NIA, the potential residual effects on the acoustic environment will not exceed the guidelines as defined in the AUC Rule 012 (AUC 2019). Therefore, based on the significance definition criteria provided in **Section 6.1.6**, the residual effects on the acoustic environment are predicted to be not significant.

6.7 Prediction Confidence

There is a high level of confidence in these results as they are based on validated quantitative modelling approaches using maximum noise emission specifications for the components included in the noise modelling exercise, terrain specifications, and known receptor locations.

6.8 Follow-Up and Monitoring

The Project is not anticipated to result in residual effects to the acoustic environment that will exceed the guidelines as defined in the AUC Rule 012 (AUC 2019) during operation and maintenance. Therefore, no follow-up and monitoring programs are proposed. Should there be noise complaints from nearby residents, OTW LP commits to assessing noise levels at those locations and determining whether noise levels exceed PSLs at the receptor location. If exceedances do occur, additional case-specific mitigation measures may be considered.

7.0 Assessment of Potential Effects on Terrain and Soil

7.1 Scope of Assessment

Terrain and soils are included as a VEC because there is the potential for the Project to affect terrain and soil conditions during the construction, operation and maintenance, and decommissioning phases of the Project. Specifically, the potential effects are associated with changes in terrain stability, wind and water erosion potential, soil quality, soil quantity, and agricultural capability of the soils within the assessed spatial boundaries.

7.1.1 Regulatory and Policy Setting

There are no federal or provincial regulations or policies that define guidelines specific to soil and terrain management, to which a project must adhere. As such, the scope of the assessment of potential effects on soils and terrain takes into account guidance included in the *Environmental Assessment Act, 1980* (Government of Saskatchewan 1980a) and the TOR that was prepared for the Project (Dillon 2019).

7.1.2 Consideration of Issues Raised During Engagement

During the open houses that were held for public engagement, a concern was raised regarding the potential for wind projects developments to result in soil compaction, which may in turn affect groundwater mobility in the area. OTW LP addressed this concern during the open house by providing documentation from a study conducted on a wind project in Alberta. The study considered the potential effects of wind energy projects and concluded that, with the application of industry-accepted BMPs, the potential for wind energy projects to cause soil compaction and adversely affect groundwater movement and availability is extremely unlikely. The application of BMPs identified for construction to avoid soil compaction will follow SaskPower's Environmental Beneficial Management Practices Manual (SaskPower 2020).

No concerns related to terrain and soils were raised during OTW LP's consultation and engagement with regulators, landowners and Indigenous communities.

7.1.3 Potential Effects, Pathways and Measureable Parameters

The primary issues and concerns that were considered in the assessment of potential effects of the Project on terrain and soils are potential changes in terrain integrity, soil quantity and soil quality as a result of Project activities. These potential effects were selected as the focus of the assessment because agriculture is the primary land use and economic activity in the Project region, the Project is sited primarily on agricultural lands, and alterations to terrain integrity, soil quantity and soil quality as a result of the Project may affect the capability of soils to produce crops or otherwise support equivalent future agricultural land use objectives.

The effects pathways and the parameters by which these effects can be measured are provided below in **Table 7-1**.

Table 7-1: Potential Effects, Pathways and Measurable Parameters for Terrain and Soil

Potential Effect	Effect Pathways	Measurable Parameters
Change in terrain integrity	Alteration of the existing surface topography as a result of soil exposure from vegetation clearing and ground disturbance during Project activities	Areal extent (ha) of changes to surface topography (i.e., distribution of slopes)
Change in soil quantity	Loss or alteration of soil types as a result of ground disturbance during Project activities	Areal extent (ha) of lost or altered soils
	Loss or alteration of soil volumes as a result of wind and/water erosion on exposed soils	
Change in soil quality	Changes in the physical, chemical, and/or biological properties of soil as a result of ground disturbance related to Project activities	Changes in soil agricultural capability
	Changes in the physical, chemical, and/or biological properties of soil as a result of spills or leaks of chemicals (e.g., fuel, oil, etc.) from vehicles and equipment during Project activities	

7.1.4 Boundaries

7.1.4.1 Spatial Boundaries

Spatial boundaries for the terrain and soil assessment have been determined based on the potential for Project activities to have effects on terrain and soils within these defined areas. The spatial boundaries are summarized in **Table 7-2** below:

Table 7-2: Spatial Boundaries for the Terrain and Soil Effects Assessment

Spatial Boundary	Boundary Description
Project Development Area (PDA)	Includes the Project footprint, which is the anticipated maximum area of physical disturbance associated with the construction and operation phases of the Project. The PDA includes the temporary (i.e., during construction) and permanent areas of physical disturbance.

Spatial Boundary	Boundary Description
Local Assessment Area (LAA)	The LAA is defined as the extents of the PDA. This area accounts for the maximum area of physical disturbance associated with the construction and operation phases of the Project, including temporary (i.e., during construction) and permanent areas of physical disturbance. The potential effects of the Project on terrain and soil are anticipated to be limited to the extents of physical disturbance, which will be contained within the boundaries of the PDA. Therefore, the extents of the LAA will allow for an effective assessment of the potential effects of the Project on terrain and soil.
Regional Assessment Area (RAA)	The RAA is also defined as the extents of the PDA. Any potential residual effects of the Project on terrain and soil that may be included in a cumulative assessment will be limited to the extents of physical disturbance, which will be contained within the boundaries of the PDA.

7.1.4.2 Temporal Boundaries

The temporal boundaries considered for the terrain and soil assessment are based on the duration of each phase of the Project, as described below in **Table 7-3**.

Table 7-3: Temporal Boundaries for the Terrain and Soil Assessment

Project Phase	Description
Construc on	The anticipated duration of the construction phase is approximately 1.5 years, which includes site preparation, construction of the Project components (e.g., WTGs, access roads, collector lines, substation, operation and maintenance building), reclamation of temporary workspaces, and Project commissioning.
Opera ons and Maintenance	The operation and maintenance phase will commence once the Project is commissioned, and is anticipated to continue for a minimum of 25 years before potential refurbishment or decommissioning may be required.
Decommissioning	The decommissioning phase is anticipated to last approximately six months, which will include the removal of above-ground infrastructure, portions of the concrete foundations, access roads and WTG pads, abandonment of buried collector lines, and reclamation of lands (including soils) within the PDA to a condition similar to pre-development conditions, and appropriate for the future land use objectives, based on consultation with the landowners and regulatory requirements at that time.

7.1.5 Residual Effects Characterization

The residual effects on terrain and soil are characterized using the terms and criteria that are summarized in **Table 7-4**.

Table 7-4: Criteria for Characterization of Residual Effects of the Project on Terrain and Soil

Criterion	Description	Quantitative Measures or Definition of Qualitative Categories
Direction	The long-term trend of the residual effect on terrain and soil	**Positive:** a residual effect that results in changes to the measureable parameters in a direction that is beneficial to terrain and soils relative to baseline conditions. **Adverse:** a residual effect that results in changes to the measureable parameters in a direction that is detrimental to terrain and soils relative to baseline conditions. **Neutral:** a residual effect that results in no net changes to the measureable parameters for terrain and soils relative to baseline conditions.
Magnitude	Degree of change in measurable parameters of terrain and soil in comparison to existing conditions	**Negligible:** no measurable change in terrain and soil from baseline conditions. **Low:** a residual effect may be detectable, but the degree of change is anticipated to be within the range of baseline or guideline values (i.e., within the normal range of natural variability). **Moderate:** a measurable residual effect on terrain integrity, soil quantity and/or soil quality that is at or slightly exceeds the normal range of natural variability. **High:** a measurable residual effect on terrain integrity, soil quantity and/or soil quality that is beyond the normal range of natural variability, which poses a risk to long-term terrain stability or agricultural capability of soils.
Geographic Extent	Geographic area in which residual effects on terrain and soil may occur	**PDA/LAA/RAA:** effects occur in the PDA, which is the boundary defined for the LAA and RAA as well.
Duration	Period of time required until the measurable parameters of effects to terrain and soil return to existing conditions, or the effect can no longer be measured	**Short-term:** a residual effect is limited to a specific Project activity. **Medium-term:** a residual effect extends throughout construction and up to 10 years into maintenance and operation of the Project, or the effect only extends throughout maintenance and operation. **Long-term:** a residual effect extends through all phases of the Project until the completion of decommissioning. **Permanent:** a residual effect extends beyond Project decommissioning, and is unlikely to recover.

Criterion	Description	Quantitative Measures or Definition of Qualitative Categories
Frequency	Number of occurrences of a residual effect over a period of time	**Single event:** a residual effect occurs only once throughout the assessed duration. **Multiple irregular events:** event occurs sporadically and/or intermittently. **Multiple regular events:** event occurs repeatedly and/or regularly. **Continuous:** event occurs continuously**.**
Reversibility	The likelihood of a changed measureable parameter of a residual effect to return to a baseline condition upon cessation or completion of a Project phase or activity	**Reversible:** a residual effect will return to a baseline condition at a predicted period through active management and mitigation. **Irreversible:** a residual effect is permanent or unlikely to return to baseline condition for the foreseeable future.

7.1.6 Significance Definition

A determination of significance is assigned to the residual effects on terrain and soil that remain after mitigation measures have been implemented. There are no Federal or Provincial regulatory criteria to determine the significance of environmental effects on terrain and soils. As such, the criteria used to determine the significance of Project effects on terrain and soil include:

- Effects that are likely to cause the long-term stability or integrity of landforms, where appropriate mitigation measures are not available;
- Effects that are likely to reduce quality or agricultural capability of soils to support the continued production of agronomic crop; and
- Effects that will result in the permanent loss of soil volumes, where appropriate mitigation measures are not available.

7.2 Existing Conditions for Terrain and Soil

The existing terrain and soil conditions were determined at the desktop level using publicly-available resources; no field surveys were completed to assess the potential effects on terrain and soil from the Project. The methods and results of the desktop analysis are described in the section below.

7.2.1 Methods

Methods used to determine terrain and soil characteristics included a desktop analysis of pertinent available sources of information including the Saskatchewan Soil Information System (SKSIS Working Group 2018) and Detailed Soil Survey Reports (Canadian Soil Information Service 2020). The desktop analysis was completed to determine the baseline terrain and soil conditions within the PDA. Note that the extents of the LAA for the terrain and soils VEC is the same as the PDA, as described in **Table 7-2**.

The desktop analysis focused on the distribution of slope classes and a general classification and identification of soil characteristics of mapped soil polygons encountered by the PDA. These soil characteristics included distribution of soil associations, agricultural capability, surficial stoniness, soil salinity and water and wind erosion sensitivity. Soil agricultural capability ratings were based on values provided by the SKSIS, which follow the Canada Land Inventory (CLI) rating system (Environment Canada 1972) of soil capability classification for agriculture. The CLI system rates climate, terrain and soil factors independently as subclasses, as each factor can control the suitability of a tract of land for crop production.

7.2.2 Results

7.2.2.1 Terrain

The topography encountered within the PDA is variable, with slopes predominately within the gentle to moderate range (2.0-10.0% slope), collectively making up 35.2% of the PDA. Strong slopes of 10-15% occur in 31.0% of the PDA, while steep slopes of 15-30% account for 33.8% of the PDA (**Table 7-5**).

Table 7-5: Distribution of Slope Classes within the PDA

Slope	Area of PDA (ha)[1]	Proportion of PDA (%)
Gentle slopes (2.0-5.0%)	3.6	1.9
Moderate slopes (5.0-10.0%)	60.8	33.3
Strong slopes (10.0-15.0%)	56.5	31.0
Steep slopes (15.0-30.0%)	61.6	33.8
Total	**182.5**	**100.0**

[1]Data source: Canadian Soil Information Service 2020.

7.2.2.2 Soil

The Project is located in the Brown Soil Zone of Saskatchewan. Four soil associations are encountered by the PDA, with Orthic Brown Chernozemic soils of the Fife Lake soil association being the most common soil type, accounting for 93.9% of the PDA. Soils within the remaining 6.1% of the PDA consist of undifferentiated complexes associated with valleys and drainages, and Regosolic soils associated with areas of exposed bedrock. Soil textures encountered by the PDA ranged from loam to clay loam, where classified. A general description of each soil map unit encountered by the PDA is summarized in **Table 7.6**.

Table 7-6: Soil Map Units Encountered within the PDA

Soil Association	Description[1]	Dominant Textures	Area of PDA (ha)	Proportion of PDA (%)
Fife Lake	Predominately Orthic Brown Chernozemic soils, with amounts of Calcareous and Eluviated soils	Loam to Clay Loam	171.3	93.9
Hillwash	Complex of shallow, eroded and weakly developed soils formed on steep valley slopes	Unclassified	1.4	0.8
Exposure	Complex of variable textured Regosolic soils and bedrock exposures	Variable	8.5	4.6
Hillwash-Exposure	A mixture of weakly developed soils formed on steep valley slopes with Regosolic soils and bedrock exposures	Variable	1.3	0.7
Total			**182.5**	**100.0**

[1]Data source: Canadian Soil Information Service 2020.

Soil Agricultural Capability

The soils encountered within the PDA range in agricultural capability from Class 3 to 6 with Class 4 having the highest percentage, accounting for approximately 47.9% of the PDA. Descriptions of each agricultural capability class based on the CLI, and the proportions of each class in the PDA are provided in **Table 7-7**.

Table 7-7: Agricultural Capability Ratings of Soils within the PDA

Dominant Agricultural Capability Class[1]	Class Description[1]	Area of PDA (ha)	Proportion of PDA (%)
1	Soils have no significant limitations in the use for crop production.	0.0	0.0
2	Soils have moderate limitations that restrict the range of crops or require moderate conservation practices.	0.0	0.0
3	Soils have moderately severe limitations that restrict the range of crops or require special conservation practices.	32.2	17.7
4	Soils have severe limitations that restrict the range of crops or require moderate conservation practices, or both.	87.4	47.9
5	Soils have very severe limitations that restrict the capability in production of perennial forage crops, though improvement practices are feasible.	53.1	29.1
6	Soils are only capable of producing perennial forage crops, and improvement practices are not feasible.	9.8	5.3
7	Soils have no capacity for arable culture or permanent pasture.	0.0	0.0
Total		**182.5**	**100.0**

[1]Data source: Environment Canada 1972.

The primary limitations to crop production include unfavourable topography, insufficient moisture holding capacity and erosion sensitivity, as described below in **Table 7-8**.

Table 7-8: Agricultural Capability Subclasses of Soils within the PDA

Dominant Agricultural Capability Subclass[1,2]	Area of PDA (ha)	Proportion of PDA (%)
M – moisture limitations	64.4	35.3
T – unfavourable topography	23.9	13.1
TM - unfavourable topography and moisture limitations	31.3	17.1
TE - unfavourable topography and wind and water erosion limitations	62.9	34.5
Total	**182.5**	**100.0**

[1]Data source: Environment Canada 1972.

[2]Two subclasses are listed for areas affected by more than one limitation. The first subclass listed identifies the primary limitation, and the second subclass indicates the secondary subclass for a rated area.

Surficial Stoniness

Within the PDA, soil surficial stoniness ranges from slightly stony (i.e., comprising 0.01% to 0.1% of surficial cover) to very stony (i.e., comprising 3% to 15% of surficial cover). Approximately 33.8% of the PDA was identified as slightly stony, while 30.2% and 29.1% were identified as moderately stony and very stony, respectively. The remaining areas of the PDA were not classified for stoniness (Canadian Soil Information Service 2020).

Soil Salinity

According to the Saskatchewan Soil Information System (SKSIS Working Group 2018), salinity in soils is classified by their potential to effect agricultural production. The majority of the soils encountered within the PDA are identified as having no effect on agricultural production due to salinity, accounting for 79.3% of the PDA, while 19.9% of soils within the PDA were identified as having a very slight effect on agricultural production due to salinity. The remaining 0.8% of soils within the PDA were not classified for salinity.

Sensitivity to Erosion

Soil sensitivity to water erosion is affected by soil texture, organic matter content, soil water content, permeability, topography, vegetation cover, slope length and slope gradient. Within the PDA, soils ranged from low to very high potential for effects from water erosion (where classified), with the majority of soils classified as moderate to high potential (i.e., accounting for approximately 63.6% of the PDA). Soils with very high potential for effects from water erosion account for approximately 29.1% of the PDA, while soils with low potential for effects from water erosion account for approximately 1.2% of the PDA. This overall sensitivity to water erosion is evident in the predominately dissected topography encountered in the PDA and the surrounding area.

Soil sensitivity to wind erosion is affected by soil texture, soil structure, soil water content, vegetation cover and wind velocity. Generally, loamy sands, which are rich in soil particles between 10 and 100 microns in size are most susceptible to wind erosion than finer or coarser textured soils (Roose 1996). All soils within the PDA that were classified for wind erosion sensitivity were identified as having a low potential for effects from wind erosion (Canadian Soil Information Service 2020).

A summary of erosion sensitivity of soils within the PDA is provided below in **Table 7-9**.

Table 7-9: Summary of Erosion Sensitivity of Soils within the PDA

Erosion Category	Rating[1]	Area of PDA (ha)	Proportion of PDA (%)
Water Erosion	Low	2.2	1.2
	Moderate	60.8	33.3
	High	55.2	30.2
	Very High	53.1	29.1
	Unclassified	11.2	6.2
Wind Erosion	Low	171.3	93.8
	Unclassified	11.2	6.2

[1]Data source: Canadian Soil Information Service 2020.

7.3 Project Interactions with Terrain and Soil

The Project may interact with terrain and soil within the PDA through the completion of various activities, particularly during the construction phase. These interactions may result in the environmental effects identified in **Table 7-1**. A summary of the interactions between specific Project activities and the terrain and soil VEC, and the potential effects that may results from these interactions, are identified below in **Table 7-10**.

Table 7-10: Summary of Project Interactions with Terrain and Soil

Project Activities	Environmental Effects		
	Change in Terrain Integrity	Change in Soil Quantity	Change in Soil Quality
Construction Phase			
Site preparation, including vegetation clearing, topsoil stripping, grading and development of WTG locations, MET tower locations, access roads, substation and temporary workspaces	✓	✓	✓
Installation of WTG and MET tower foundations; erection of WTGs and MET towers	–	✓	✓
Installation of collector lines and substation infrastructure	✓	✓	✓
Post-construction reclamation of temporary workspaces	✓	✓	✓

Project Activities	Environmental Effects		
	Change in Terrain Integrity	Change in Soil Quantity	Change in Soil Quality
Operation and Maintenance Phase			
Operation and use of WTGs, MET towers, substation and access roads	–	–	–
Routine and unplanned maintenance of WTGs	–	–	–
Routine and unplanned maintenance of collector lines, substation infrastructure and access roads	–	–	–
Decommissioning Phase			
Dismantling and removal or Project infrastructure, including WTGs, collector lines, substation infrastructure and access roads	✓	✓	✓
Site reclamation	✓	✓	✓

Note: ✓ denotes a potential interaction; – denotes no interaction.

7.4 Assessment of Residual Environmental Effects on Terrain and Soil

7.4.1 Analytical Assessment Techniques

The assessment of potential environmental effects of the Project on terrain and soil was completed by calculating and estimating the changes to the following measurable parameters:

- Areal extent of existing surface topography (i.e., slope distribution) affected by the Project;
- Areal extent of soils lost or altered by the Project; and
- Changes in soil agricultural capability.

7.4.2 Change in Terrain Integrity

7.4.2.1 Effect Pathways

<u>Construction Phase</u>

Potential changes in terrain integrity by the Project are largely limited to the construction phase. During site preparation, steep slopes (i.e. greater than 15% slope) may require grading to facilitate safe access to the PDA by Project vehicles and equipment, and to allow for structure installation. Grading these areas could result in localized changes to the surface expression on the landscape.

Soil exposed during clearing and grading activities may result in changes to terrain integrity through increased erosion, sediment transfer and changes to natural drainage patterns. Erosional processes may be initiated or accelerated by changes to soil structure as a result of construction activities (e.g., soil compaction from Project-related traffic).

Operation and Maintenance Phase

Project activities during the operation and maintenance phase are not anticipated to affect terrain integrity, as these activities will be restricted to the PDA that was prepared during the construction phase. As such, there are no anticipated effects from Project activities during the operation and maintenance phase.

Decommissioning Phase

The pathways for potential effects on terrain integrity by the Project during the decommissioning phase are similar to the construction phase. Soil exposed during the dismantling and removal of Project infrastructure (including WTGs, collector lines, substation infrastructure and access roads) may increase the potential for soil erosion, sediment transfer and changes to natural drainage patterns. Previously graded areas within the PDA may be re-contoured during reclamation activities to return the lands within the PDA to an equivalent land capability, which could result in localized changes to the surface expression on the landscape.

7.4.2.2 Mitigation Measures

During the construction and decommissioning phases of the Project, industry BMPs, avoidance of sensitive areas and standard mitigation measures will be implemented. The following Project-specific mitigation measures will be implemented to address potential changes to terrain integrity:

- Project components will be sited to avoid steep or unstable topographic features, where feasible, to limit the amount of required grading;
- Graded areas will be re-contoured and reclaimed to a stable surface profile, where grading is required to facilitate access or structure installation;
- Existing public roads and previously disturbed areas will be used where possible to provide access to the WTG locations and collector line routes, which will reduce ground disturbance and the amount of required new access road construction for the Project;
- Natural drainage patterns will be maintained, where practical; and
- Erosion and sediment control measures will be implemented to limit the potential for erosion or transportation of exposed soils, which may compromise terrain integrity.

Mitigation measures to address the potential changes in terrain integrity are provided in detail in the EPP in **Appendix C**.

7.4.2.3 Predicted Residual Effects

Construction Phase

Changes in terrain integrity are anticipated to occur on steep slopes within the PDA during the construction phase of the Project. The PDA has been designed to avoid steep slopes where possible; however, approximately 33.8% of the PDA is comprised of steeply-sloped areas. During site preparation, these areas will be avoided as much as possible to reduce the amount of grading required to develop the PDA.

Following the application of mitigation measures, the potential residual effects on terrain integrity during construction are characterized below in **Table 7-11**.

Table 7-11: Characterization of Residual Effects on Terrain Integrity during Project Construction

Criterion	Measure	Description
Direction	Adverse	Changes to the slope distribution are anticipated to occur during construction
Magnitude	Low	The areal extent of slopes that will be graded is small in the context of the PDA
Geographical Extent	PDA	Changes to terrain integrity will be limited to the PDA
Duration	Medium/Long-term	Graded areas in temporary workspaces will be re-contoured during post-construction reclamation, while graded areas in operational areas of the PDA will be re-contoured during the decommissioning phase
Frequency	Single event	Terrain integrity will be affected once, during the construction phase
Reversibility	Reversible	Changes to terrain integrity are anticipated to be reversible during post-construction reclamation and site decommissioning

Decommissioning Phase

Changes in terrain integrity during the decommissioning phase are anticipated to be similar to those during the construction phase. Dismantling and removal of Project infrastructure will result in ground disturbance and expose soils on which vegetation would have re-established following post-construction reclamation. These disturbed and exposed soils may increase the potential for soil erosion, sediment transfer and changes to natural drainage patterns.

Upon removal of infrastructure, previously graded areas within the PDA may be re-contoured to a stable surface profile, as the lands are reclaimed to an equivalent land capability, or to an alternate land capability as determined through consultation with landowners and regulatory agencies.
Following the application of mitigation measures, including proper soil handling and erosion and sediment control, the potential residual effects on terrain integrity during decommissioning are characterized below in **Table 7-12**.

Table 7-12: Characterization of Residual Effects on Terrain Integrity during Project Decommissioning

Criterion	Measure	Description
Direction	Adverse	Changes to the slope distribution are anticipated to occur during decommissioning
Magnitude	Low	The areal extent of slopes that will be re-contoured is small in the context of the PDA
Geographical Extent	PDA	Changes to terrain integrity will be limited to the PDA
Duration	Medium-term	Graded areas in temporary workspaces will be re-contoured during the decommissioning phase
Frequency	Single event	Terrain integrity will affected once, during the decommissioning phase
Reversibility	Reversible	Changes to terrain integrity are anticipated to be reversible during the decommissioning phase

Through the application of industry BMPs and the mitigation measures proposed above, as well as those included in the EPP in **Appendix C**, the potential residual effects to terrain integrity as a result of the Project are anticipated to be low, limited to the PDA, and reversible following Project decommissioning.

7.4.3 Change in Soil Quantity

7.4.3.1 Effect Pathways

Construction Phase

Project construction will require the disturbance, removal and stockpiling of soils to install Project facilities and infrastructure. The construction activities that may result in changes to soil quantity and distribution include topsoil stripping, grading, excavating, trenching and Project vehicle and equipment traffic. These activities may cause changes in soil quantity and distribution as a result of soil admixing (i.e., mixing of organic and mineral soil types), as well as water and wind erosion and subsequent sediment transportation from areas of exposed soils within the PDA.

Operation and Maintenance Phase

Project activities during the operation and maintenance phase are not anticipated to affect soil quantity, as these activities will be restricted to developed areas of the PDA that was prepared during the construction phase. Further, traffic along the Project access roads during operation and maintenance is anticipated to be infrequent. As such, there are no anticipated effects from Project activities during the operation and maintenance phase.

Decommissioning Phase

The pathways for potential effects on soil quantity during the decommissioning phase are similar to the construction phase. Dismantling and removal of Project infrastructure (including WTGs, collector lines, substation infrastructure and access roads) will require grading, excavating, trenching, replacement of topsoil, and Project vehicle and equipment traffic. These activities may cause changes in soil quantity and distribution as a result of soil admixing, as well as soil exposure, which may increase the potential for soil erosion, sediment transfer as well as water and wind erosion and subsequent sediment transportation from disturbed areas within the PDA.

7.4.3.2 Mitigation Measures

During the construction and decommissioning phases of the Project, industry BMPs, avoidance of erosion sensitive areas and standard mitigation measures will be implemented, including those applicable from SaskPower (2020). The following Project-specific mitigation measures will be implemented to address potential changes to soil quantity:

- Soil disturbance will be limited to the areas required for the construction of permanent components and operation of the Project;
- Proper soil management techniques will be used during construction and decommissioning, including stripping and storing topsoil and subsoil separately, and maintaining adequate separation distance between topsoil and subsoil stockpiles;
- Experienced equipment operators will be used for topsoil stripping and storage and qualified environmental personnel will monitor the process to ensure proper separation of topsoil and subsoils;
- Salvaged topsoil will be stored within the PDA away from waterbodies, vehicle and equipment travel routes, and areas of future disturbance, to reduce soil handling;
- Stripped topsoil will be replaced following construction, and erosion protection measures will be implemented on stripped areas of the PDA, including installation of erosion blankets, mulches or straw crimping, as required;
- Disturbed areas in lands not subject to annual cultivation for agricultural production will be promptly seeded following construction and/or decommissioning to provide temporary or permanent vegetation cover, to protect the soil from water and wind erosion;
- Existing public roads and previously disturbed areas will be used where possible to provide access to the WTG locations and collector line routes, which will reduce ground disturbance and the amount of required new access road construction for the Project;
- Temporary workspaces will not be cleared of vegetation if possible, to reduce the total area of exposed soil;
- Stockpiled materials from clearing or grading activities will be stored in locations outside of areas of natural surface drainage, to limit the potential for erosion or transportation of exposed soils;
- Erosion and sediment control measures will be implemented as required to limit the potential for erosion or transportation of exposed soils; and
- Ground disturbance activities will be completed during dry or frozen conditions, where and when practical, to reduce the potential for soil compaction and admixing as a result of rutting.

Mitigation measures to address the potential changes in soil quantity are provided in detail in the EPP in **Appendix C**.

7.4.3.3 Predicted Residual Effects

Construction Phase

Changes in soil quantity are anticipated to occur during the construction phase of the Project, though mitigation measures will largely limit the potential loss. The maximum area of soil disturbance from Project construction is 182.5 ha, which is the maximum extent of the PDA. However, soil disturbance will be avoided in temporary workspaces (e.g., laydown areas) where required, and will not occur where portions of the Project area includes existing areas of development (e.g., roads and trails), so the actual area of soil disturbance during construction will be less than the total area of the PDA. Further, following construction activities, non-operational areas of the PDA that were disturbed by construction, including collector line routes and temporary workspaces of access roads, will be reclaimed using the soil that was stockpiled during construction. Application of industry BMPs to prevent the loss of soil from construction activities will limit the potential for changes in soil quantity.

Following the application of appropriate mitigation measures, the predicted residual effects on soil quantity during construction are characterized below in **Table 7-13**.

Table 7-13: Characterization of Residual Effects on Soil Quantity during Project Construction

Criterion	Measure	Description
Direction	Adverse	Changes to soil quantity are anticipated to occur during construction
Magnitude	Low	Changes to soil quantity will be measurable by the areal extent of soil disturbance within the PDA
Geographical Extent	PDA	Effects on soil quantity will be limited to the PDA
Duration	Medium/Long-term	Disturbed soils in temporary or non-operational workspaces will be reclaimed during post-construction reclamation, while the disturbed soils within the operational areas of the PDA will be reclaimed during the decommissioning phase using stockpiled soils that are preserved through mitigation measures.
Frequency	Single event	Soil quantity will be affected once, during the construction phase
Reversibility	Reversible	Changes to soil quantity are anticipated to be reversible during post-construction reclamation and site decommissioning

Decommissioning Phase

Changes in soil quantity during the decommissioning phase are anticipated to be similar to those during the construction phase. Dismantling and removal of Project infrastructure will result in ground disturbance and exposed soils on which vegetation would have re-established following post-construction reclamation. These disturbed and exposed soils may increase the potential for soil loss due to erosion and sediment transfer; however, BMPs applied during decommissioning, as with construction, will limit the amount of soil lost.

Upon removal of infrastructure, disturbed areas within the PDA will be reclaimed to an equivalent land capability, or to an alternate land capability as determined through consultation with landowners and regulatory agencies. Therefore, while decommissioning activities will result in soil disturbance, the total soil quantity will be increased to pre-construction levels following completion of post-decommissioning reclamation.

Following the application of mitigation measures, including proper soil handling and erosion and sediment control, the potential residual effects on soil quantity during decommissioning are characterized below in **Table 7-14**.

Table 7-14: Characterization of Residual Effects on Soil Quantity during Project Decommissioning

Criterion	Measure	Description
Direction	Adverse	Soil quantity will be affected during decommissioning; however, there will be an increase in total quantity following completion of post-decommissioning reclamation
Magnitude	Low	Changes to soil quantity will be measurable by the areal extent of soil disturbance within the PDA during decommissioning; however, there will be an increase in total soil quantity following completion of post-decommissioning reclamation
Geographical Extent	PDA	Effects on soil quantity will be limited to the PDA
Duration	Short-term	All disturbed soils within the PDA will be reclaimed during the decommissioning phase
Frequency	Single event	Soil quantity will be affected once, during the decommissioning phase
Reversibility	Reversible	Changes to soil quantity are anticipated to be reversible upon completion of decommissioning

Through the application of industry BMPs and the mitigation measures proposed above, as well as those included in the EPP in **Appendix C**, the potential residual effects to soil quantity as a result of the Project are anticipated to be low, limited to the PDA, and reversible following decommissioning.

7.4.4 Change in Soil Quality

7.4.4.1 Effect Pathways

Construction Phase

Changes in soil quality could potentially occur during Project construction, which may result in changes to the agricultural capability of soils within the PDA. Changes in soil quality may be caused by admixing, compaction, erosion, and contamination from spills or leaks. The Project activities during construction that have the potential to affect soil quality include topsoil stripping, grading, excavating, trenching and Project vehicle and equipment traffic.

Soil admixing may occur through improper separation of topsoil and subsoil during site preparation, or excessive rutting by vehicle and equipment traffic. Admixing can alter the physical, chemical and biological properties of the soil, including texture, structure, moisture holding capacity, salinity and organic content. These are important factors in determining overall soil health (Ewing and Singer 2012), and affect the capability of soils to support agricultural production and establishment of vegetation communities. Soil compaction may occur as a result of heavy equipment use (SaskPower 2020).

Operation and Maintenance Phase

Project activities during the operation and maintenance phase are not anticipated to affect soil quality, as these activities will be restricted to developed areas of the PDA that was prepared during the construction phase, and will generally consist of lighter vehicles and equipment traveling on the access roads. Further, traffic along the Project access roads during operation and maintenance is anticipated to be infrequent. As such, there are no anticipated effects from Project activities during the operation and maintenance phase.

Decommissioning Phase

The pathways for potential effects on soil quality during the decommissioning phase are similar to the construction phase. Dismantling and removal of Project infrastructure (including WTGs, collector lines, substation infrastructure and access roads) will require topsoil stripping, grading, excavating, trenching and Project vehicle and equipment traffic. These activities may cause changes in soil quality and distribution as a result of soil admixing, compaction, as well as soil exposure, which may decrease the quality of soils within the PDA.

7.4.4.2 Mitigation Measures

During the construction and decommissioning phases of the Project, industry BMPs, avoidance of sensitive areas and standard mitigation measures will be implemented, including those applicable from SaskPower (2020). The following Project-specific mitigation measures will be implemented to address potential changes to soil quality:

- All vehicles and equipment will arrive on-site in a clean and well-maintained condition, and will be free of leaks, oil and grease residue;
- Vehicles and equipment will be cleaned and sanitized to prevent the spread of crop pests such as clubroot), as needed;
- Vehicles and equipment will be regularly inspected, appropriately maintained, and safely operated at all times;
- All vehicles and equipment will be equipped with spill response materials while on-site;
- Ground disturbance activities will be completed during dry or frozen conditions, where and when practical, to mitigate soil compaction, pulverization and rutting;
- Project components have been sited to avoid steep or stable topographic features, where feasible, to limit the amount of required grading and reduce the potential for soil admixing;

- Existing public roads and previously disturbed areas will be used where possible to provide access to the WTG locations and collector line routes, which will reduce overall ground disturbance and the amount of required new access road construction for the Project;
- Temporary workspaces will not be cleared of vegetation if possible, to reduce the total area of exposed soil;
- Equipment operators will use care when stripping topsoil to ensure appropriate stripping depths to reduce admixing;
- A three-lift process will be used when grading or excavating as appropriate (e.g., saline soils) to salvage subsoil horizons separately and preserve soil quality;
- Where grading is required, subsoil will be stockpiled on areas where topsoil has been previously removed, or on stable barriers (e.g., matting, geosynthetic material) to prevent soil admixing;
- During post-construction reclamation, soil compaction can be alleviated by deep ploughing subsoils prior to replacement of salvaged topsoil; and
- Salvaged topsoil will be replaced on stripped areas with minimal soil handling to maintain soil integrity and prevent admixing.

Mitigation measures to address the potential changes in soil quality are provided in detail in the EPP in **Appendix C**.

7.4.4.3 Predicted Residual Effects

The PDA is predominately located on cultivated lands used for agricultural production. As such, agricultural capability was selected as the measurable parameter to detect and quantify changes to soil quality caused by the Project. Project activities have the potential to result in changes to soil quality through processes including soil admixing, compaction, rutting, and contamination caused by spills or leaks. These changes in soil quality may in turn result in changes in agricultural capability.

Through the application of industry BMPs and the mitigation measures proposed above, as well as those included in the EPP in **Appendix C**, soil quality is anticipated to be maintained within the PDA during the construction, operation and maintenance, and decommissioning phases of the Project. Therefore, no residual effects to soil quality as a result of the Project are anticipated.

7.5 Assessment of Cumulative Environmental Effects on Terrain and Soil

The assessment of residual effects of the Project on terrain and soils described in **Section 7.4** determined that construction and operation of the Project will result in localized changes in terrain and soil within the PDA. However, through the application of diligent mitigation measures and industry BMPs (SaskPower 2020), the magnitude of these changes within the PDA is low, and is considered negligible on a regional scale. Further, these changes are considered temporary in nature, as the construction areas will be re-contoured and soils will be redistributed when the PDA is reclaimed to an equivalent land capability.

Given the localized and temporary nature of the potential effects on terrain and soil from the Project, and there is no potential for overlap with other current or foreseeable projects in the area, no potential cumulative effects on terrain and soil from the Project are anticipated.

7.6 Determination of Significance

The potential residual effects on terrain and soil will be localized and temporary in nature, and can be mitigated with the application of standard mitigation measures and industry BMPs. Therefore, based on the significance definition criteria provided in **Section 7.1.6**, the residual effects on terrain and soil are predicted to be not significant.

7.7 Prediction Confidence

Based on the information collected during the desktop analysis, observations during the field surveys, and the Project team's understanding of Project activities, the predicted confidence in the assessment of potential effects of the Project on terrain and soils is moderate to high. Some uncertainty exists in the exact amount of change in terrain that will occur during Project construction, as additional opportunities for avoidance of steep terrain within the PDA may be determined by the construction contractor at the onset of construction. However, there is a high level of confidence in the effectiveness of the mitigation measures proposed in **Section 7.4** for each of the potential residual effects.

7.8 Follow-Up and Monitoring

OTW LP will retain the services of an Environmental Monitor during construction to evaluate the effectiveness of the mitigation measures related to terrain and soils, and to ensure that the mitigation measures and procedures included in the EPP (see **Appendix C**) are being followed. Similarly, the PDA will be monitored following construction and decommissioning, to evaluate the effectiveness of reclamation activities.

8.0 Assessment of Potential Effects on Vegetation and Wetlands

8.1 Scope of Assessment

Vegetation and wetlands are included as a VEC because there is potential for the Project to affect vegetation diversity and species richness, as well as wetland area and function during the construction and decommissioning phases of the Project. Specifically, potential effects on vegetation are associated with changes in vegetation community diversity, plant species diversity, plant SOMC occurrence and areas of occupancy, and changes in native prairie land cover area. Wetland potential effects are associated with changes in wetland function and area.

8.1.1 Regulatory and Policy Setting

8.1.1.1 Federal Regulatory Requirements

The Government of Canada's strategy to protect plant SOMC is comprised of three components, which are described below.

Species at Risk Act, 2002

The Federal *Species at Risk Act, 2002* (SARA) (Government of Canada 2002) protects Schedule 1 extirpated, endangered, and threatened plant species and their designated critical habitat on Federally-regulated lands (i.e., Crown land).

Under Section 32(1) of the SARA: *"No person shall kill, harm, harass, capture or take an individual of a wildlife species that is listed as an extirpated species, an endangered species or a threatened species."*

Under Section 58(1) of the SARA: *"No person shall destroy any part of the critical habitat of any listed endangered species or of any listed threatened species – or of any listed extirpated species if a recovery strategy has recommended the reintroduction of the species into the wild in Canada."*

Plant species are assessed and provided designation recommendations by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). These designations are recommended by COSEWIC and are provided legal protection under SARA. The Government of Canada recommends a 300 m year round setback distance from all federally designated plant SOMC for high disturbance (Class 3) activities (Government of Canada 2017).

Federal Accord for the Protection of Species at Risk

The *Accord for the Protection of Species at Risk* (Government of Canada 1996) was established as a national collaborative approach to protect SOMC in Canada. This Accord includes the commitments of the federal, provincial and territorial governments to designate SOMC, protect their critical habitats and develop recovery plans. The activities completed under the Accord are coordinated by the Canadian Endangered Species Conservation Council, which is comprised of the federal ministers of Environment and Climate Change, Fisheries and Oceans and Canadian Heritage, as well as the provincial and territorial ministers responsible for vegetation and wildlife species.

Habitat Stewardship Program for Species at Risk

The Habitat Stewardship Program (HSP; Government of Canada 2020a) was established by the federal government as a system to provide funding for projects and activities that directly contribute to recovery objectives and population goals for SOMC and prevent other species from becoming designated as SOMC. Funds provided under the HSP are administered for terrestrial stewardship projects by ECCC, while funding for aquatic stewardship projects are administered by Fisheries and Oceans Canada.

8.1.1.2 Provincial Regulatory Requirements

The Wildlife Act, 1998

The Provincial *Wildlife Act*, 1998 (Government of Saskatchewan 1998) protects designated species (i.e., those listed as extirpated, endangered, threatened, or vulnerable).

Under Section 51(1)a of *The Wildlife Act*: *"No person shall kill, injure, possess, disturb, take, capture, harvest, genetically manipulate or interfere with or attempt to do any of those things to any designated species."*

Plant species are assessed and recommendations for designation under *The Wildlife Act* are provided by the Saskatchewan Conservation Data Centre (SKCDC). The SKCDC evaluates and assigns conservation ranks (S-Rank) to plant species in the Province of Saskatchewan. This conservation ranking process is based off of review of the SKCDC database, scientific and government literature, publications, consultation with experts, and field work. Conservation statuses are based off of the rarity of a species, the population trend and the overall threat of the species. Conservations ranking is from S5: secure/common to S1: critically imperiled/extremely rare. In the Province of Saskatchewan, plant SOMC are considered S3: vulnerable/rare to uncommon, S2: imperiled/very rare and S1: critically imperiled/extremely rare (SKCDC 2019a). This process helps to inform species designations under *The Wildlife Act.* The *Saskatchewan Activity Restriction Guidelines for Sensitive Species* recommends a 30 m year round setback distance from all S1 to S3 plant species for high disturbance activities (ENV 2017).

Provincial Weed Control Act, 2010

The Provincial *Weed Control Act, 2010* (Government of Saskatchewan 2010b) and *Weed Control Regulations* ((Government of Saskatchewan 2010c) designates species as nuisance, noxious, or prohibited.

Under Section 14(2)a, b and c of *The Weed Control Act* "*Every occupant of land shall notify the owner, within five business days after their detection, of the presence of prohibited, noxious or nuisance weeds*" and "*notify the municipality of the weed inspector for the municipality in which the land is located, within five business days after their detection, of the presence of any prohibited weeds or any isolated infestations of noxious weeds*" and "*comply with any order of a weed inspector respecting the land on which the person is an occupant.*"

The Province of Saskatchewan has a designated list of weeds identified as nuisance, noxious and prohibited (Government of Saskatchewan 2010b).

Provincial Environmental Management and Protection Act, 2010

The Provincial *Environmental Management and Protection Act*, *2010* (Government of Saskatchewan 2010a) protects watercourses and waterbodies.

Under Section 38(4)a, b and c of the *Environmental Management Protection Act* "*No person shall directly or indirectly alter of cause to be altered the configuration of the bed, bank or boundary of any river, stream, lake, creek, marsh or other watercourse or water body*" and "*remove, displace or add any sand, gravel or other material, in or to the bed, bank or boundary of any river, stream, lake, creek, marsh or other watercourse or water body*" and "*remove vegetation from the bed, bank or boundary of any river, stream, lake, creek, marsh or other watercourse or water body.*"

Any proposed activities to be completed in the bed, bank or boundary of any river, stream, lake, creek, marsh or other watercourse or water body in the Province of Saskatchewan require an Aquatic Habitat Protection Permit (AHPP) from the Water Security Agency (WSA) (Water Security Agency 2020b).

8.1.2 Consideration of Issues Raised During Consultation and Engagement

During initial consultation meetings with ENV to discuss the proposed field survey program, ENV requested that vegetation community surveys be included with the suite of planned field surveys for the Project, to characterize the vegetation community of the Project area. As a result, vegetation community surveys were added to the field survey plan, and were completed during the 2016 and 2017 field programs (see **Section 8.2.2.2)**.

During subsequent consultation meetings, concerns were raised by ENV regarding the extent of native prairie in the Project area, and recommended that OTW LP should consider this land cover carefully during the Project siting and layout design. As a result, the Project layout was designed to avoid placing any WTGs and temporary workspaces on native prairie. Following their review of the TPP, ENV issued a Ministerial Determination in which the Project was deemed a development under the *Environmental Assessment Act* (Government of Saskatchewan 1980a). The Reasons for Determination that accompanied the Ministerial Determination stated that the Project was likely to have a significant impact on the environment due to the presence of large intact areas of native prairie surrounding the Project, and that 21.6 ha of native prairie within the PDA would be directly impacted by the Project.

Following issuance of the Ministerial Determination, and in consideration of ENV's concerns, OTW LP completed extensive revisions to the Project layout and design. By selecting a higher capacity turbine model, the maximum number of WTGs was reduced from 60 locations to 37 locations (including 4 alternate locations). Further, the associated Project infrastructure (i.e., access roads and collector lines) was redesigned to avoid native prairie land cover to the extent feasible, which reduced the area of native prairie land cover within the PDA from 21.6 ha to 8.3 ha; of which 0.7 ha will be occupied by permanent infrastructure (i.e., access roads and overhead collector lines). In addition to these modifications, rare plant surveys were completed in 2019 to better assess the actual rare plant communities within the Project PDA.

Similar concerns regarding potential impacts on native prairie were raised during engagement meetings with NGOs, including Nature Saskatchewan and PPPI. Their concerns were addressed during the engagement meetings, as summarized in **Table 3-2** of **Section 3.3.6**, and were also considered during revisions of the Project layout to reduce and avoid native prairie to the extent possible.

No concerns related to vegetation and wetlands were raised during engagement with stakeholders, Indigenous communities, or the public.

8.1.3 Potential Effects, Pathways and Measureable Parameters

The primary issues and concerns that were considered in the assessment of potential effects of the Project on vegetation are potential changes in vegetation community diversity and plant species diversity (including SOMC). These potential effects were selected as the focus of the assessment to evaluate compliance of the Project with the federal SARA and provincial *Wildlife Act* and their protection for plant SOMC and the native prairie habitat in which they are most likely to occur. The Project has components sited on native prairie, and alterations to native prairie have the potential to affect vegetation community and plant species diversity and plant SOMC populations.

The primary issues and concerns that were considered in the assessment of potential effects of the Project on wetlands are potential alterations to wetland function and changes in wetland area. The Project has components sited within wetlands, and alterations to wetlands have the potential to impact wetland function and overall wetland area. Wetlands have an important role in the ecological function of a landscape; they regulate water levels during periods of flooding or drought, contribute to clean water sources by filtering excess nutrients and provide habitat to support many plant and wildlife species.

Note also that potential effects to vegetation and wetlands would carry over into potential effects on wildlife and wildlife habitat. The assessment of these potential effects is completed in **Section 9.0.** The effects pathways and parameters by which these effects can be measured are provided below in **Table 8-1**.

Table 8-1: Potential Effects, Pathways and Measurable Parameters for Vegetation and Wetlands

Potential Effects	Effect Pathways	Measurable Parameters
Change in vegetation community diversity	Alterations of species diversity of the existing vegetation community as a result of vegetation clearing and ground disturbance activities	Areal extent (ha) of lost or altered native vegetation communities (e.g., grassland, broadleaf land cover classes)
Change in plant species diversity	Loss or alteration of plant SOMC individuals or populations as a result of vegetation clearing and ground disturbance activities	Population density and distribution of plant SOMC occurrences
	Introduction and/or spread of non-native invasive plant species through vehicle and equipment operation during Project activities	Density and distribution of non-native invasive plant species populations
Change in wetland area and function	Loss or alteration of wetland area or changes in physical (vegetation community and density and water quantity), chemical, and/or biological properties of the wetland as a result of Project activities	Areal extent (ha) of lost and/or changed wetland

Note: ha = hectares.

8.1.4 Boundaries

8.1.4.1 Spatial Boundaries

Spatial boundaries for the vegetation and wetlands assessment have been determined based on the potential for Project activities to have effects on vegetation and wetlands within these defined areas. Spatial boundaries are summarized in **Table 8-2** and presented in **Figure 8-1.**

Table 8-2: Spatial Boundaries for the Vegetation and Wetlands Effects Assessment

Spatial Boundary	Description
Project Development Area (PDA)	Includes the Project footprint, which is an cipated maximum area of physical disturbance associated with construc on and opera on phases of the Project. The PDA includes the temporary (i.e., during construc on) and permanent areas of physical disturbance.
Local Assessment Area (LAA)	The LAA is defined as the extents of the PDA and an area extending an additional 300 m beyond the boundaries of the PDA. This area represents the maximum extent of direct effects of the Project on vegetation and wetlands, and accounts for the largest possible setback for plant SOMC according to the SARA and the *Saskatchewan Activity Restriction Guidelines for Sensitive Species* (ENV 2017).

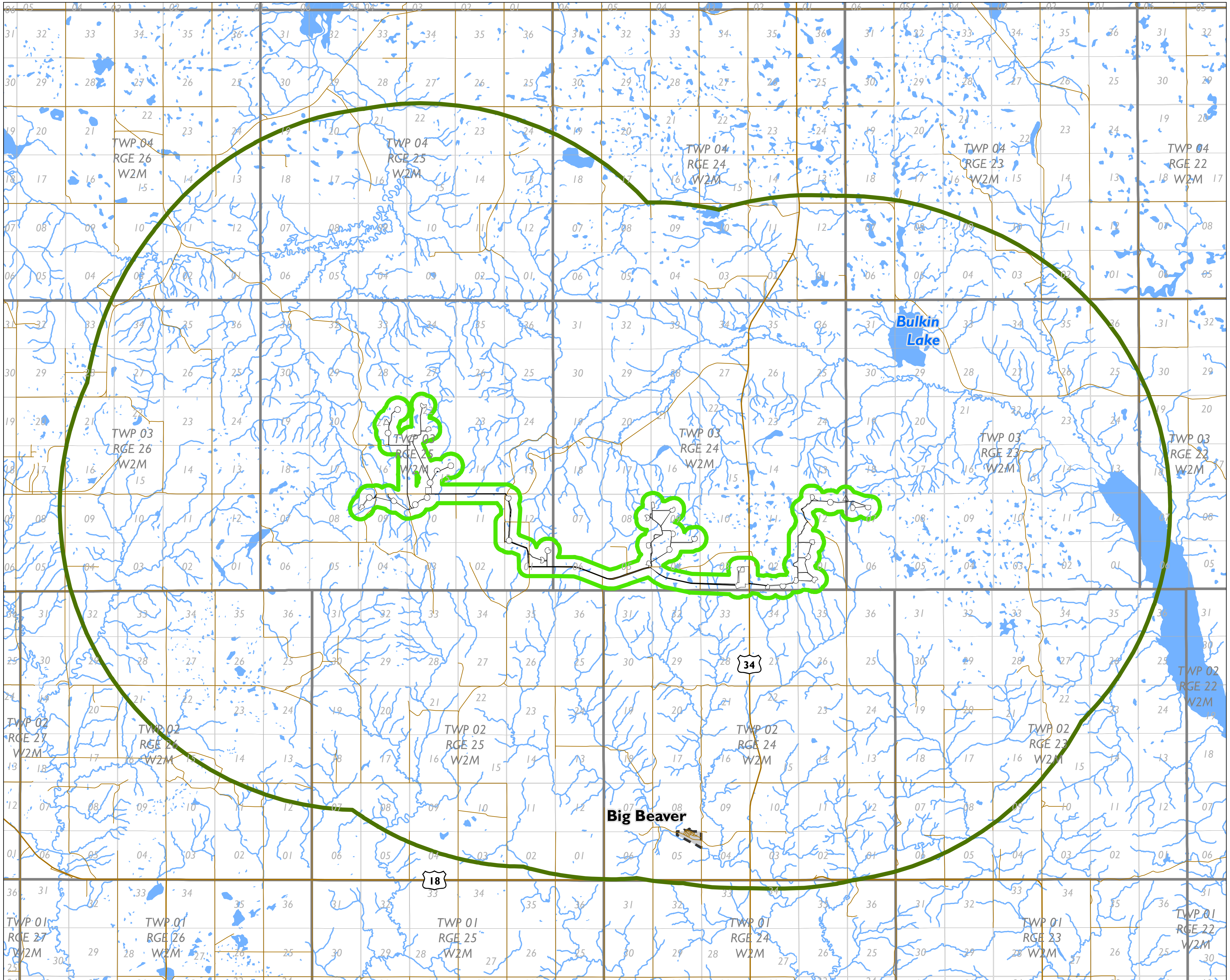
Spatial Boundary	Description
Regional Assessment Area (RAA)	The RAA is defined as the extents of the PDA and an area extending an additional 10 km beyond the boundaries of the PDA. This area is considered the extent to which any indirect or cumulative effects on vegetation and wetlands by the Project and other projects or developments in the region can be assessed. Further, this area allows for a characteriza on of vegeta on communi es and wetland pa erns at a regional scale.

8.1.4.2 Temporal Boundaries

The temporal boundaries considered for the vegetation and wetland assessment are based on the duration of each phase of the Project, as described below in **Table 8-3**.

Table 8-3: Temporal Boundaries for Vegetation and Wetlands

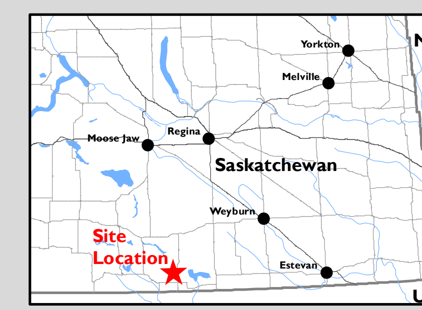
Project Phase	Description
Construc on	The anticipated duration of the construction phase is approximately 1.5 years, which includes site preparation, construction of the Project components (e.g., WTGs, access roads, collector lines, substation, operation and maintenance building), reclamation of temporary workspaces, and Project commissioning.
Opera ons and Maintenance	The operation and maintenance phase will commence once the Project is commissioned, and is anticipated to continue for a minimum of 25 years before potential refurbishment or decommissioning may be required.
Decommissioning	The decommissioning phase is anticipated to last approximately six months, which will include the removal of above-ground infrastructure, portions of the concrete foundations, access roads and WTG pads, abandonment of buried collector lines, and reclamation of lands within the PDA to a condition similar to pre-development conditions, and appropriate for the future land use objectives, based on consultation with the landowners and regulatory requirements at that time.



OUTLAW TRAIL WIND LP
OUTLAW TRAIL WIND ENERGY PROJECT

FIGURE 8-1
VEGETATION AND WETLANDS ASSESSMENT AREAS

- Vegetation and Wetlands Local Assessment Area
- Vegetation and Wetlands Regional Assessment Area
- Project Development Area
- Minor Roads
- Major Roads
- Hamlet
- Township
- Section
- Watercourse
- Waterbody



1:125,000

0 1 2 4 Kilometers

MAP DRAWING INFORMATION:

DATA PROVIDED BY CANVEC, ESRI, GEOSASK & DILLON CONSULTING

MAP CREATED BY PH
MAP CHECKED BY CD

MAP PROJECTION: NAD 1983 UTM Zone 13N ROTATION: -0.25°

PROJECT: 191825
STATUS: FINAL
DATE: 2021-03-01

FILE LOCATION: G:\GIS\2019\191825 - Outlaw Trail Energy Project\Product\Client\EIS\Figure 8_1 Vegetation and Wetlands Assessment Areas.mxd

8.1.5 Residual Effects of Characterization

The residual effect on vegetation and wetlands are characterized using the terms and criteria that are summarized in **Table 8-4**.

Table 8-4: Characterization of Residual Effects of the Project on Vegetation and Wetlands

Characterization	Description	Quantitative Measures or Definition of Qualitative Categories
Direction	The long-term trend of the residual effect on vegetation and wetlands	**Positive:** an increase in the number and/or distribution of plant SOMC; an increase in the area of native vegetation land cover; a decrease in non-native and/or invasive plants; an increase in wetland area and/or function. **Adverse:** a decrease in the number and distribution of plant SOMC; a decrease in native vegetation land cover; an increase in non-native and/or invasive plants; a decrease in wetland area and/or function. **Neutral:** no change in the number and/or distribution of plant SOMC; no net change in native prairie land cover; no net change in non-native and/or invasive plants; no net change in wetland area and/or function.
Magnitude	The degree of change in measurable parameters of vegetation and wetlands in comparison to existing conditions	**Negligible:** no measurable change in vegetation and wetland parameters **Low:** unlikely to have measurable effects on the number of plant SOMC, native vegetation land cover, non-native and/or invasive plants, or wetland area and/or function in the LAA; temporary local shifts in distribution may occur. **Moderate:** likely effects on the number and distribution of plant SOMC, native vegetation land cover, non-native and/or invasive plants, or wetland area and/or function in the LAA; unlikely to have measurable effects in the RAA. **High:** confirmed effects on the number and distribution of plant SOMC, native vegetation land cover, non-native and/or invasive plants, or wetland area and/or function in the RAA.
Geographic Extent	The geographic area in which residual effects on vegetation or wetlands may occur	**PDA:** a residual effect is limited to within the extents of the PDA **LAA**: a residual effect extends into the LAA. **RAA**: a residual effect interacts with other projects or developments in the RAA.

Characterization	Description	Quantitative Measures or Definition of Qualitative Categories
Duration	The period of time required until the measurable parameters of effects to vegetation or wetlands return to existing conditions, or the effect can no longer be measured	**Short-term:** a residual effect is limited to a specific Project activity. **Medium-term:** a residual effect extends throughout construction and up to 10 years into maintenance and operation of the Project, or the effect only extends throughout maintenance and operation. **Long-term:** a residual effect extends through all phases of the Project until the completion of decommissioning. **Permanent:** a residual effect extends beyond Project decommissioning, and is unlikely to recover.
Frequency	Number of occurrences of a residual effect over a period of time	**Single event:** a residual effect occurs only once throughout the assessed duration. **Multiple irregular events:** event occurs sporadically and/or intermittently. **Multiple regular events:** event occurs repeatedly and/or regularly. **Continuous:** event occurs continuously.
Reversibility	The likelihood of a changed measurable parameter of a residual effect to return to a baseline condition upon cessation or completion of a Project phase or activity	**Reversible:** a residual effect will return to a baseline condition at a predicted period through active management and mitigation. **Irreversible:** a residual effect is permanent or unlikely to return to baseline condition for the foreseeable future.

8.1.6 Significance Definition

A determination of significance is assigned to the residual effects on vegetation and wetlands that remain after mitigation measures have been implemented. There are no federal or provincial regulatory criteria to determine significant effects on vegetation and wetlands. As such, the criteria used to determine the significance of Project effects on vegetation and wetlands include:

- Effects that pose a risk to the long-term viability and persistence of native vegetation communities in the RAA, including those that are not consistent with federal recovery strategies or provincial conservation objectives where appropriate mitigation (including offsetting) are not available;
- Effects that pose a risk to the long-term viability and persistence of plant SOMC within the RAA, including those that are not consistent with federal recovery strategies or provincial conservation objectives; and
- Effects that are likely to result in a permanent loss in wetland area and/or function, where appropriate mitigation or compensation options are not available.

8.2 Existing Conditions for Vegetation and Wetlands

The existing conditions of vegetation communities and wetlands within the PDA, LAA and RAA were determined through a desktop review of publicly-available resources, followed by a range of field surveys. The desktop review and field surveys collected information on the distribution of land cover classes, historical and verified occurrences of plant SOMC and characterization of wetlands. The methods used to complete the desktop review and field surveys and a summary of their findings are described in the section below.

8.2.1 Methods

8.2.1.1 Desktop Review

Land Cover Classification

Methods used to determine baseline land cover include a desktop review of pertinent available sources of information including:

- Agriculture and Agri-foods Canada (AAFC) land cover dataset imagery from 2015 and 2016 (AAFC 2015, 2016 and 2019);
- Google Earth® (imagery from October 23, 2013 and September 12rd, 2019);
- Bing Maps® (imagery from October 10, 2016);
- Environmental Systems Research Institute (ESRI) World Imagery (imagery from 2006 and 2011; ESRI [2017]); and
- Saskatchewan Geospatial Imagery Collaboration (SGIC) FlySask ortho imagery (60 cm) from 2008-2011 and 2012-2013 (SGIC 2017).

The desktop review was completed to determine the baseline vegetation and wetland conditions within the PDA. Provincial databases and aerial photography allowed for the determination of land cover. The desktop review was completed to assist in the vegetation and wetland field studies and survey design for the Project.

Land cover classes were obtained from the AAFC land cover dataset (AAFC 2015, 2016, and 2019). The AAFC 2015 and 2016 datasets were used to help determine locations for field programs and in preparation of the Technical Proposal. The AAFC (2019) land cover definitions were used and refined to meet the needs of the EIS, based on the land cover and vegetation communities anticipated to be encountered within the LAA. These land cover classes were used during field survey planning to select survey locations, identify areas of potential habitat to support plant SOMC, and assist in Project siting. A summary of the land cover classes and their descriptions are provided in **Table 8-5**.

Table 8-5: Land Cover Classification based on AAFC Definitions

Land Cover Class	Description
Broadleaf	Tree species (>10 m tall); deciduous forest.
Cropland	Crops seeded and harvested annually (i.e., wheat, canola, lentils, etc).
Developed	Buildings in urban and rural areas and farmsteads; commercial and industrial plants, gravel pits, and mine structures; anthropogenic routes for vehicles including surfaced/paved highways and non-surfaced trails.
Drainage	Flowing water (i.e., rivers, stream, seasonal drainages, etc.).
Dugout	Anthropogenic wetlands (i.e., class V wetland functions).
Barren/Exposed Land	Undeveloped and barren (i.e., lacks vegetation; composed of rock outcrops, gravel beds, sand pits, etc).
Native Grassland	Sod layer has never been converted to agricultural production; dominated by a minimum of 51% native species cover. (i.e., needlegrasses (*Hesperostipa* spp., *Nassella viridula*), wheat/wildrye grasses (*Pascopyrum smithii*, *Elymus* spp., *Leymus* spp.), etc.).
Pasture/Forages	Periodically cultivated. Includes tame grasses and other perennial crops such as alfalfa (*Medicago sativa*) and sweet clover (*Melilotus* spp.) grown alone or as mixtures for hay, pasture or seed.
Shrubland	Predominantly woody vegetation of relatively low height (approximately 2 m height). May include grass or wetlands with woody vegetation, regenerating forest.
Water	Water bodies (lakes, reservoirs, rivers, streams, salt water, etc.).
Wetlands[1]	Water table near/at/above soil surface for sufficient time to promote wetland or aquatic processes.

[1] Based on Stewart and Kantrud (1971).

Land cover was classified a 1:3,000 scale where land cover units larger than 0.04 ha were mapped. Land cover data was further corrected and refined based on field surveys completed throughout the LAA. Beyond the extents of the LAA, land cover within the RAA was classified based primarily on the AAFC datasets; due the large areal extent and regional scale of the context in which it is included in the assessment, land cover within RAA was not verified in the field. As a result, dugouts and drainages are included in the wetland and water land cover classes in the RAA.

Plant SOMC with Potential to Occur in the Vegetation LAA

A desktop review of pertinent available information sources was completed to identify plant SOMC that have potential to occur within the PDA, LAA, and RAA. This information was also used during the field survey design, to determine survey locations. The following information sources were queried:

- Species at Risk public registry of plants listed under the SARA (Government of Canada 2020b);
- SKCDC Hunting, Angling and Biodiversity Information tool (HABISask), which provides records of historical occurrences of plant SOMC within the Province of Saskatchewan (Government of Saskatchewan 2020); and

- SKCDC tracked vascular plants species by ecoregion list (Saskatchewan Conservation Data Centre 2019b).

Weed Species with Potential to Occur in the Vegetation LAA

The provincial W*eed Control Act* (Government of Saskatchewan 2010b) regulates weeds designated as prohibited, noxious and nuisance under the *Weed Control Regulations* (Government of Saskatchewan 2010c) summarized in **Table 8-6**. Weeds designated as noxious and prohibited were identified during field studies within the vegetation LAA.

Table 8-6: Weed Designations, Definition and Regulatory Objectives

Provincial Designation	Definition	Regulatory Objective
Prohibited	Pose a significant economic and/or environmental threat.	Early detection and eradication upon discovery in consultation with the weed inspector and the Saskatchewan Ministry of Agriculture.
Noxious	Locally established within a limited area.	Prevent invasion to uninfected areas.
Nuisance	Widely established and may spread easily from one area to the next.	Address the underlying reason for their occurrences and to take measures to reduce their long-term effect.

Classification and Delineation of Wetland Classes within the Wetland LAA

Wetlands within the LAA were delineated and classified through desktop mapping, to create a wetlands data layer from which wetland field survey locations were determined. Wetlands were delineated and classified using the Stewart and Kantrud (1971) wetland classification system, which is summarized in **Table 8-7**. Dugouts and drainages are not included in this classification system; however, these features were mapped due to their potential to provide suitable habitat for vegetation and wildlife species. Wetland desktop mapping was completed at a 1:3,000 scale, where all wetlands 0.04 ha and larger were delineated and classified (i.e., wetlands less than 0.04 ha were not delineated or classified). Desktop mapping is limited by imagery; however imagery from both dry and wet years were used to map wetland extents conservatively. This wetland data layer was later confirmed during field surveys at predetermined survey locations. Wetlands identified and delineated in the field were incorporated into the desktop wetland layer resulting in further refined wetland numbers, locations, classes and delineations. Wetlands were delineated and classified within the LAA, while wetland extents within the Project RAA were based on the AAFC land cover layer (AAFC 2015, 2016).

Table 8-7: Summary of Stewart and Kantrud (1971) Wetland Classification System

Wetland Class	Wetland Name	Description
Class I	Ephemeral wetland	Surface water present for short periods of time (i.e., few days after snowmelt, storm events).
Class II	Temporary wetland	Surface water present for periodic periods (i.e., few weeks after snowmelt, storm periods).
Class III	Seasonal ponds and lakes	Surface water present for longer seasonal periods (i.e., few months after snowmelt, storm periods).
Class IV	Semi-permanent ponds and lakes	Surface water present for growing season (i.e., May to September).
Class V	Permanent ponds and lakes	Surface water present year round.

8.2.1.2 Field Surveys

Vegetation Community Surveys

Vegetation community surveys were completed to document the baseline conditions of the vegetation communities, identify features related to vegetation communities, and determine the potential for land cover classes within the LAA to support rare plants. One round of vegetation community surveys was completed from September 7 to 8, 2016, and second round of surveys was completed from June 26 to 29, 2017 to account for additional target lands that were added to the Project after the 2016 surveys were completed.

Vegetation community surveys were completed in accordance with the survey protocol provided in the Rangeland Health Assessment for Native Grassland (Saskatchewan Prairie Conservation Action Plan 2008). According to Thorpe (2014), the LAA encounters four rangeland ecosites: loam, badlands, thin and overflow. As such, the vegetation community survey locations were sited to capture information from each of the four ecosites. Each site was surveyed using 1 m^2 quadrat to study and characterize the vegetation community. The legal subdivision and UTM location was recorded at each survey site using a handheld global positioning system (GPS) unit, representative photos were collected, and the percent cover of all vascular plant species within the quadrat was measured. When plant SOMC were identified during the vegetation community surveys, the plant species, number of individuals, and UTM coordinates were documented and representative photos were collected. Non-native invasive plant species designated under *The Weed Control Act* (Government of Saskatchewan 2010b) were also documented as they were encountered through the vegetation community surveys.

Rare Plant Surveys

Rare plant surveys were completed in 2019 to identify the presence of plant SOMC during the early-blooming (June 22 to 28) and late-blooming seasons (August 12 to 16). Surveys were completed in accordance with the ENV Species Detection Survey Protocol: 20.0 Rare Vascular Plant (ENV 2019). The surveys were designed to target land cover classes with potential to support plant SOMC (i.e., grasslands, pasture/forages, wetlands, shrubland and broadleaf land cover classes) within the PDA, plus to additional 30 m setback as per the *Saskatchewan Activity Restriction Guidelines for Sensitive Species* (ENV 2017). A belt-transect approach was used to complete the rare plant surveys, which consisted of transects 5 m in width and up to 1,000 m in length that were surveyed on-foot by two qualified professionals working in pairs. The transect locations were assigned through random stratification, to capture a minimum of 3% of the total area of each land cover type within the PDA and 30 m setback that could provide suitable habitat for rare plants. It should be noted that a previous PDA layout was used to design the rare plant surveys, and the findings from the 2019 rare plant surveys were considered during the final design of the PDA.

The early season rare plant survey consisted of 48 transects, while the late season rare plant survey consisted of 30 transects, after 18 transects were not re-surveyed as the habitat was not deemed suitable to support rare plants. Where rare plants were detected, the extents of the populations were delineated, the abundance estimated, the UTM coordinates were recorded using a handheld GPS and information was collected on the habitat conditions in which they were found.

Wetland Surveys

Wetland surveys were completed in conjunction with the vegetation community surveys from June 26 to 29, 2017. Surveys were completed on a subset of wetlands that were identified during desktop wetland mapping. Of the 170 mapped wetlands within the LAA (excluding drainages and dugouts), 31 or approximately 18% of the wetlands were field verified. The results of the field verification were used to correct the desktop wetland mapping as necessary. Data that was collected during the wetland field surveys included wetland class based on Stewart and Kantrud (1971), dominant vegetation species, UTM coordinates, legal subdivision and representative photos. The boundary of each wetlands was also verified in the field.

8.2.2 Results

8.2.2.1 Desktop Review

Ecoregions and Landscape Areas in the Vegetation LAA

The Project is situated in the Prairie Ecozone, the Mixed Grassland Ecoregion, and the Wood Mountain Plateau and Coteau Lakes Upland landscape areas (Acton *et al*. 1998).

The Mixed Grassland Ecoregion makes up 13% of the province of Saskatchewan, approximately 62% of this region is used for agriculture including pasture/rangeland and cropland. Landscapes vary from level to gently undulating interrupted by hummocky valleys. This ecoregion contains a semiarid climate and a vegetation community composed of mid grasses and short grasses. These grass communities are dominated by wheatgrasses *(Elymus* spp., *Leymus* spp. and *Pascopyrom* spp.) and speargrasses (*Hesperostipa* spp. and *Nasella* spp.) commonly situated on the gentle to undulating areas, blue grama grass (*Bouteloua gracilis*) commonly situated on the drier upper slopes and a sub-dominate grass community of June grass (*Koeleria macrantha)* and sedge species (*Carex spp.*). Shrubland communities commonly located in depressions are typically dominated by pasture sage (*Artemisia frigida*), roses (*Rosa spp.*), snowberry (*Symphoricarpos occidentalis*), wolf willow (*Eleagnus commutate*), Saskatoon (*Amelanchier alnifolia*) and chokecherry (*Prunus virginiana*). Wetlands are dominated by grasses, sedges and rushes (Acton *et al*. 1998).

Land Cover Classification

The Project footprint is the portion of the PDA that will be occupied by Project components for the duration of the Project (i.e., WTG pads, access roads, substation, collector lines and MET towers). The PDA is comprised of both the permanent footprint and the temporary workspaces required during construction and will be reclaimed within the construction phase.

The Project footprint comprises a total area of 25.1 ha, which is predominately located on cropland (16.8 ha or 67.2% of the Project footprint) followed by developed land (5.1 ha or 20.4% of the Project footprint) and pasture/forage (2.3 ha or 9.3% of the Project footprint). The Project footprint was designed to avoid native land cover classes (i.e., grassland, broadleaf, shrubland, wetlands and drainages) where possible; as such, only small portions of each land cover class are intersected by the Project footprint: 0.7 ha of grassland accounting for 2.9% of the Project footprint, and less than 0.1 ha of wetlands accounting for 0.2% of the Project footprint (broadleaf, shrubland and drainages are not encountered by the Project footprint). Note that the native grassland within the Project footprint occur where existing agricultural trails require expansion to create access roads suitable for maintenance vehicles, and do not represent areas of contiguous intact native grassland.

The PDA comprises a total area of 182.5 ha and is also dominated by cropland (131.2 ha or 71.9% of the PDA), followed by pasture/forage (27.9 ha or 15.3% of the PDA), developed land (14.1 ha or 7.7% of the PDA) and grassland (8.3 ha or 4.5% of the PDA). Wetlands, drainages, broadleaf lands and shrublands collectively account for 1.2 ha or 0.6% of the PDA. Native land cover classes collectively account for 9.4 ha or 5.1% of the PDA, which will experience low or moderate disturbance and be returned to their previous land cover type following the completion of construction.

The LAA, which includes the PDA and an additional 300 m distance beyond the extents of the PDA, comprises a total area of 2,634.5 ha. Similar to the PDA, land cover within the LAA is predominately cropland (1,151.3 ha or 43.7% of the LAA), followed by grassland (807.8 ha or 30.7% of the LAA), pasture/forages (394.6 or 15.0% of the LAA), broadleaf (114.9 ha or 4.4% of the LAA), wetlands (90.7 ha or 3.4% of the LAA) and developed lands (55.5 ha or 2.1% of the LAA). The areas outside the PDA will not experience direct effects of the Project.

The RAA, which includes the PDA and an additional 10 km distance beyond the extents of the PDA, comprises a total area of 74,794.5 ha. Land cover within the RAA is dominated by grassland associated with the Big Muddy Valley located north of the Project (37,271.1 ha or 49.8% of the RAA), followed by cropland (23,079.0 ha or 30.9% of the RAA), pasture/forages (7,754.0 ha or 10.4% of the RAA), barren/exposed land (2,466.1 ha or 3.3% of the RAA) and broadleaf (1,608.7 ha or 2.2% of the RAA), developed lands (864 ha or 1.2% of the RAA), wetlands (852.2 ha or 1.1% of the RAA), water (506.8 ha or 0.7% of the RAA) and shrublands (392.3 ha or 0.5% of the RAA).

Land cover areas and proportions throughout the PDA, LAA, and RAA are summarized in **Table 8-8**. Land cover within the LAA is presented in **Figure 8-2.**

Table 8-8: Land Cover Classes within the Vegetation and Wetlands PDA, LAA and RAA

Land Cover Class	Project Permanent Footprint[1]		PDA (Project Footprint and Temporary Workspaces)[1]		LAA[1]		RAA[2]	
	Area (ha)	Proportion (%)	Area (ha)	Proportion (%)	Area (ha)	Proportion (%)	Area (ha)	Proportion (%)
Broadleaf	0.0	0.0%	0.3	0.2%	114.9	4.4%	1,608.7	2.2%
Cropland	16.8	67.2%	131.2	71.9%	1,151.3	43.7%	23,079.0	30.9%
Developed	5.1	20.4%	14.1	7.7%	55.5	2.1%	864.3	1.2%
Drainage	0.0	0.0%	0.1	0.0%	11.8	0.4%	-	-
Dugout	0.0	0.0%	0.0	0.0%	2.5	0.1%	-	-
Grassland	0.7	2.9%	8.3	4.5%	807.8	30.7%	37,271.1	49.8%
Pasture/Forage	2.3	9.3%	27.9	15.3%	394.6	15.0%	7,754.0	10.4%
Shrubland	0.0	0.0%	0.1	0.0%	3.9	0.1%	392.3	0.5%
Water[2]	0.0	0.0%	0.0	0.0%	1.5	0.1%	506.8	0.7%
Wetlands	<0.1	0.2%	0.7	0.4%	90.7	3.4%	852.2	1.1%
Barren/Exposed Land	0.0	0.0%	0.0	0.0%	0.0	0.0%	2,466.1	3.3%
Total[3]	25.1	100.0%	182.5	100.0%	2,634.5	100.0%	74,794.5	100.0%

[1] Land cover metrics are based on the desktop mapping.

[2] Data is based on AAFC 2019.

[3] Area totals may not add up due to rounding of numbers.

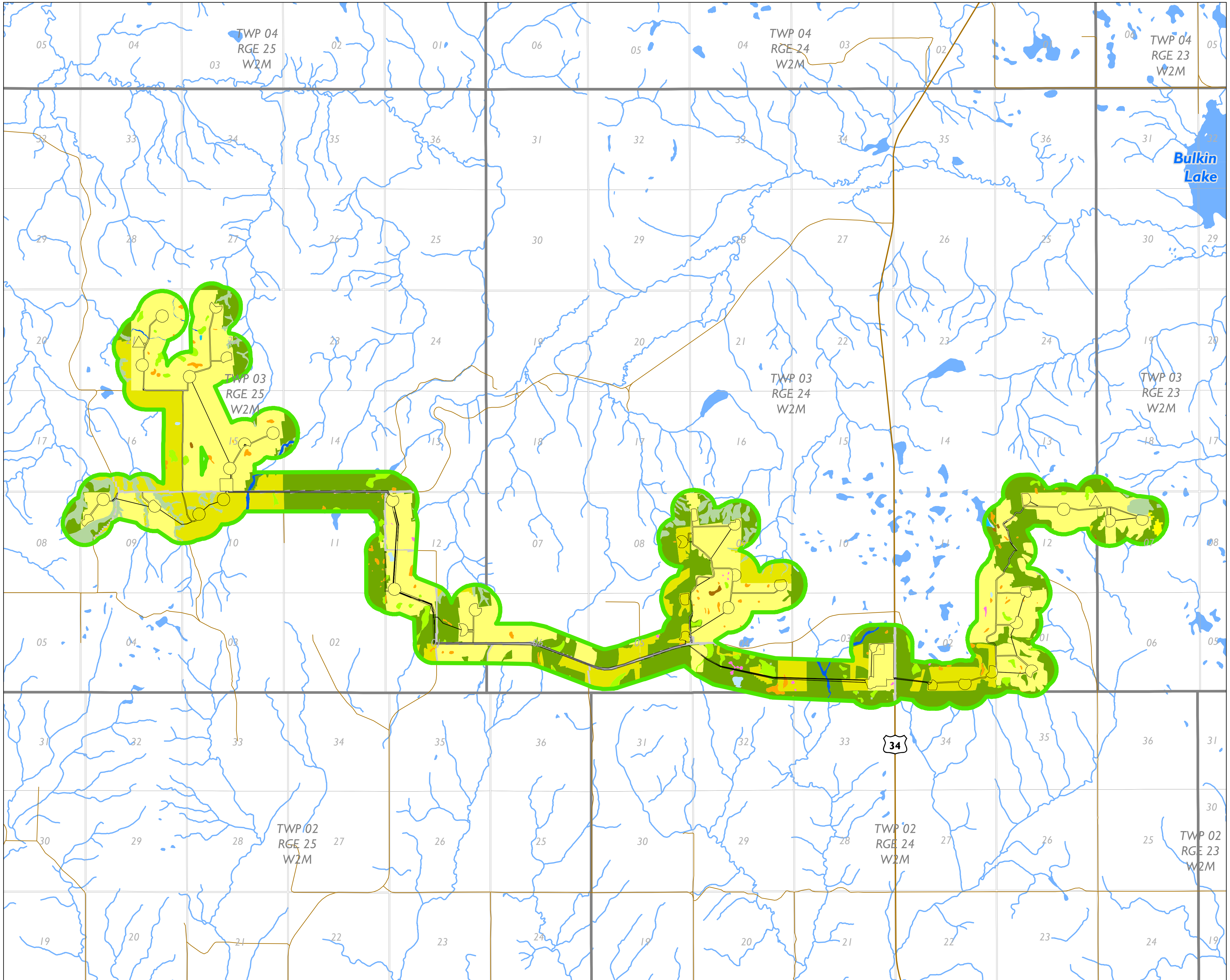


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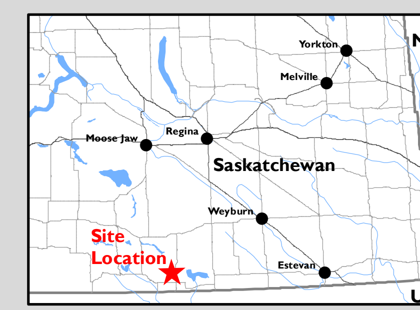
FIGURE 8-2
LAND COVER CLASSES IN THE VEGETATION AND WETLANDS LOCAL ASSESSMENT AREA

- Project Development Area
- Vegetation and Wetlands Local Assessment Area

Land Cover

- Class 1 - Ephermeral Wetland
- Class 2 - Temporary Wetland
- Class 3 - Seasonal Wetland
- Class 4 - Semi-Permanent Wetland
- Class 5 - Permanent Wetland
- Drainage
- Dugout
- Agricultural
- Broadleaf
- Exposed Land / Barren
- Native Grassland
- Pasture / Forages
- Shrubland
- Urban / Developed
- Water

- Minor Roads
- Major Roads
- Hamlet
- Township
- Section
- Watercourse
- Waterbody



1:60,000

0 0.5 1 2 Kilometers

MAP DRAWING INFORMATION:

DATA PROVIDED BY AAFC, CANVEC, ESRI, GEOSASK, STANTEC & DILLON CONSULTING

MAP CREATED BY PH
MAP CHECKED BY CD

MAP PROJECTION: NAD 1983 UTM Zone 13N ROTATION: -0.25°

DILLON CONSULTING

PROJECT: 191825

STATUS: FINAL

DATE: 2021-03-01

FILE LOCATION: G:\GIS\2019\191825 - Outlaw Trail Energy Project\Product\Client\EIS\Figure 8_2 Land Cover Classes in the Vegetation and Wetlands Local Assessment Area.mxd

Historical Observations of Plant SOMC

No historical records of plant SOMC were identified within the LAA. An additional search of the HABISask database in January, 2020 identified records of plant SOMC within the LAA (Government of Saskatchewan 2020); however, these records corresponded to the observations that were documented during the baseline field surveys for this Project (see **Section 8.2.2.2**) and reported to ENV, as per the Species Detection Research Permit requirements.

8.2.2.2 Field Surveys

The following section describes existing conditions of the PDA and LAA based on vegetation and wetland field survey results. Field surveys consisted of vegetation community surveys, rare plant surveys and wetland surveys. Additional information, including land cover verification and the presence of non-native invasive plant species, were collected in conjunction with these surveys.

Vegetation Community Surveys

During the 2016 and 2017 vegetation community surveys, 34 sites were surveyed (**Table 8-9**, **Appendix G**) as per Thorpe (2014). A total of 176 vascular plant species were observed during the vegetation communities (see **Appendix H, Table H.1**), including six plant SOMC at 37 locations within the LAA. The plant SOMC observations are summarized with the rare plant survey results in the following section. Vegetation community sites were dominated by loam ecosites that are described as having well-drained and medium to moderately fine textured soils. The remainder of the vegetation community ecosites occupied thin soils, were located on steep slopes, in areas with high erosion potential, area of exposed bedrock (i.e., badlands), and in low-lying meadows (i.e., subirrigated) (Thorpe 2014). The vegetation community sites included dry areas that were dominated by plant species including northern wheatgrass (*Elymus lanceolatus ssp. lanceolatus*) and needle-and-thread grass (*Hesperostipa comate ssp. comate*) as well as moist shrubland sites dominated by plant species including chokecherry (*Prunus virginiana var. virginiana*) and Saskatoon (*Amelanchier alnifolia var. alnifolia*). A summary of the vegetation community survey results are provided below in **Table 8-9**.

Table 8-9: Results from the 2016 and 2017 Vegetation Community Surveys

Site No.	Easting	Northing	Vegetation Community[1, 2]	Quarter Section	Dominant Plant Species
BE01MS	491372	5448837	MG-LM-H	SW-12-03-24-W2M	Western snowberry (*Symphoricarpos occidentalis*)– porcupine grass (*Hesperostipa curtiseta*)
BE02MS	491405	5448745	MG-LM-C	SW-12-03-24-W2M	Needle and thread grass (*Hesperostipa comata* ssp. *comata*)– northern wheatgrass (*Elymus lanceolatus* ssp. *lanceolatus*)
BE03MS	491472	5449437	MG-LM-H	NW-12-03-24-W2M	Western snowberry – porcupine grass

Site No.	Easting	Northing	Vegetation Community[1, 2]	Quarter Section	Dominant Plant Species
BE04MS	491729	5449272	MG-LM-H	NW-12-03-24-W2M	Western snowberry – porcupine grass
BE05MS	492268	5449015	MG-LM-G	SE-12-03-24-W2M	Crested wheatgrass (*Agropyron cristatum* ssp. *pectinatum*) – native grasses
BE06MS	491890	5448496	MG-TH-D	SW-12-03-24-W2M	Creeping juniper (*Juniperus horizontalis*)
BE07MS	491439	5447641	MG-LM-C	NW-01-03-24-W2M	Needle and thread grass – northern wheatgrass
BE08MS	485750	5448974	MG-LM-C	SE-08-03-24-W2M	Needle and thread grass – northern wheatgrass
BE09MS	485936	5449133	MG-LM-C	SE-08-03-24-W2M	Needle and thread grass – northern wheatgrass
BE10MS	485935	5448797	PEZ-SUB-D	SE-08-03-24-W2M	Chokecherry (*Prunus virginiana* var. *virginiana*)- Saskatoon (*Amelanchier alnifolia* var. *alnifolia*)
BE11MS	485961	5448321	MG-LM-E	NE-05-03-24-W2M	Pasture sage (*Artemisia frigida*)– needle and thread grass – northern wheatgrass
BE12MS	487092	5448587	MG-LM-F	SE-09-03-24-W2M	Blue grama (*Bouteloua gracilis) –* pasture sage – June grass (*Koeleria macrantha*)
BE13MS	487299	5448794	MG-LM-C	SE-09-03-24-W2M	Needle and thread grass – northern wheatgrass
BE14MS	485963	5447918	MG-LM-n.y.d.	NE-05-03-24-W2M	Smooth brome (*Bromus inermis*) – native grasses (not yet described)
BE15MS	489603	5447268	MG-LM-D	SW-02-03-24-W2M	Needle and thread grass – sedge (*Carex* spp.) – pasture sage
BE16MS	488313	5447725	MG-LM-C	NW-03-03-24-W2M	Needle and thread grass – northern wheatgrass
BE17MS	488024	5447812	MG-LM-H	NW-03-03-24-W2M	Western snowberry – porcupine grass
BE18MS	478300	5449819	MG-LM-D	NW-10-03-25-W2M	Needle and thread – sedge – pasture sage
BE19MS	482252	5448158	MG-LM-D	NE-01-03-25-W2M	Needle and thread – sedge – pasture sage
BE20MS	479615	5442738	MG-TH-D	SE-21-02-25-W2M	Creeping juniper
BE21MS	480801	5444805	MG-LM-C	NE-27-02-25-W2M	Needle and thread grass – northern wheatgrass

Site No.	Easting	Northing	Vegetation Community[1, 2]	Quarter Section	Dominant Plant Species
BE22MS	481306	5446407	MG-LM-G	NE-34-02-25-W2M	Crested wheatgrass – native grasses
BE23MS	484757	5445421	MG-LM-D	SW-31-02-24-W2M	Needle and thread – sedge – pasture sage
BE24MS	484821	5444750	MG-LM-D	NW-30-02-24-W2M	Needle and thread – sedge – pasture sage
V1	478781	5452864	MG-BD-B	NW-22-03-25-W2M	Western wheatgrass
V10	490144	5446696	MG-LM-B	NW-34-02-24-W2M	Western porcupine grass – northern wheatgrass – sedge – pasture sage
V11	492973	5448919	MG-BD-B	SW-07-03-23-W2M	Western wheatgrass
V13	486909	5443866	DMG-LM-E	SW-29-02-24-W2M	Blue grama – needle and thread grass – June grass – western wheatgrass
V2	476538	5449396	MG-LM-B	NW-09-03-25-W2M	Western porcupine grass – northern wheatgrass – sedge – pasture sage
V20	485985	5449429	DMG-LM-D	NE-08-03-24-W2M	June grass – needle and thread grass – pasture sage – blue grama
V4	479988	5448196	DMG-LM-D	NW-02-03-25-W2M	June grass – needle and thread grass – pasture sage – blue grama
V5	483097	5445495	DMG-LM-A	SW-36-02-25-W2M	Northern wheatgrass – needle and thread grass
V6	485310	5445987	MG-LM-C	SW-31-02-24-W2M	Needle and thread grass – northern wheatgrass
V7	484970	5444744	DMG-LM-A	NW-30-02-24-W2M	Northern wheatgrass – needle and thread grass

Note:

[1] Vegetation communities are defined in Thorpe (2014). An example of a vegetation community abbreviation for a reference community in the mixed grassland on a loam ecosite is MG-LM-A. Vegetation communities that are altered from the reference community are given sequential abbreviations (e.g., B, C, D, etc.).

[2]Legend:

DMG – dry mixed grassland

LM – loam

MG – mixed grassland ecoregion

n.y.d. – not yet described (community has no data in Thorpe [2014])

PEZ – prairie ecozone

SUB – subirrigated and overflow

TH - thin

Rare Plant Surveys

A total of 17 plant SOMC were observed in 116 locations during the 2019 rare plant surveys. Furthermore, as discussed in the above section, 7 plant SOMC were observed in 52 locations during the 2016 and 2017 vegetation community surveys, resulting in a combined total of 21 plant SOMC observed at 168 locations during the field surveys. Following the completion of the rare plant surveys, the PDA layout was revised, which reduced the overall area of the PDA, as well as the proportion of the PDA located on land cover classes with habitat suitable to support rare plants. As a result of the layout revision, 19 plant SOMC were observed at 109 locations within in the LAA (see **Table 8-10**). No federally designated plant SOMC were observed during the 2016, 2017 or 2019 field surveys.

Of the 109 plant SOMC observations within the LAA, 9 SOMC were observed in 28 locations within the 30 m setback distance but outside of the PDA, and 6 SOMC were observed in 15 locations within the PDA boundary (see **Table 8-10** and **Appendix G**). It should be noted that early cinquefoil (*Potentilla concinna var. concinna*) was observed during the 2016 vegetation community surveys within the LAA. The provincial rank of this species was updated from an S4 to an S2 on April 26, 2016; however, it was not identified as a plant SOMC at the time, and the location(s) in which early cinquefoil was observed were not documented. As such, this species has been included in **Table 8-10** and conservatively assumed to be present within the PDA, thought the number and locations of the observations have not been included.

A comprehensive list of vascular plant species observed during the 2016, 2017 and 2019 vegetation surveys is included in **Appendix H, Table H.1**.

Table 8-10: Plant SOMC Observed during Field Surveys within the Vegetation and Wetlands PDA and LAA

Scientific Name	Common Name	S-Rank	LAA	Within 30 m of PDA	PDA
			# of Observations	# of Observations	# of Observations
Bidens frondosa	tall Beggar's-ticks	S3	1	-	-
Botrychium campestre	prairie dunewort	S2	1	-	-
Castilleja sessiliflora	downy paintbrush	S3	1	-	-
Echinacea angustifolia var. angustifolia	narrow-leaved purple coneflower	S3	1	1	-
Elatine triandra	longstem water-wort	S2	1	-	-
Festuca hallii	plains rough fescue	S3	5	-	-
Hymenopappus filifolius var. polycephalus	tufted hymenopappus	S3	10	5	-
Marsilea vestita	pepperwort	S3	1	-	-
Mertensia lanceolata var. lanceolata	prairie bluebells	S3	3	2	-
Myosurus minimus	least mousetail	S3	1	-	-

Scientific Name	Common Name	S-Rank	LAA	Within 30 m of PDA	PDA
			# of Observations	# of Observations	# of Observations
Orobanche ludoviciana	Louisiana broom-rape	S3	4	2	1
Paronychia sessiliflora	low whitlowwort	S3	11	7	1
Phlox alyssifolia ssp. *alyssifolia*	blue wild phlox	S3	38	13	5
Physaria spatulata	spatulated bladderpod	S3	3	3	-
Polygala alba	white milkwort	S3	15	6	4
Potentilla concinna var. concinna[3]	early cinquefoil	S2	Unknown	Unknown	Unknown
Potentilla lasiodonta	sandhills cinquefoil	S2	11	4	4
Rorippa curvipes	curved yellow-cress	S3	1	-	-
Rosa blanda	smooth wild rose	S1	1	-	-
Total				**43**	**15**

[1] Taxonomy based on the SKCDC 2020.

[2] S-Rank based on SKCDC 2019a.

[3] *Potentilla concinna var. concinna* was observed during the 2016 vegetation community surveys; however, it was not identified as a plant SOMC at the time, it the location(s) of the observations were not documented. The SKCDC updated the provincial rank of this species on April 26, 2016.

Wetland Surveys

Based on the desktop mapping and field verification, 26 wetlands and 5 drainages are intersected by the PDA, which account for 0.7 ha or 0.4% of the PDA. The wetlands within the PDA were predominately classified as Class III seasonal wetlands, which account for 71% of the total wetland area in the PDA. Within the LAA, 170 wetlands, 8 drainages and 6 dugouts were identified, accounting for 105 ha or 4.0% of the LAA (see **Table 8-11**).

Table 8-11: Wetland Classes, Drainages and Dugouts within the PDA and LAA

Wetland Class	PDA			LAA		
	No.	Area (ha)	Proportion (%)	No.	Area (ha)	Proportion (%)
I - Ephemeral	3	<0.1	0.0%	13	3.2	0.1%
II - Temporary	7	0.1	0.1%	89	26.3	1.0%
III - Seasonal	14	0.5	0.3%	63	56.7	2.2%
IV - Semi-Permanent	2	<0.1	0.0%	2	3.1	0.1%
V - Permanent	0	0.0	0.0%	3	1.4	0.0%
Drainage	5	0.1	0.0%	8	11.8	0.5%
Dugout	0	0.0	0.0%	6	2.53	0.1%
Total	31	0.7	0.4%	184	105.0	4.0%

A subset of 31 wetlands were selected for field survey delineation and classification confirmation during the 2017 field season (see **Appendix G**).

Non-Native Invasive Plant Species

Eight non-native invasive plant species were documented during the 2016 and 2017 vegetation community and wetland surveys, including four noxious and four nuisance species. No prohibited weeds were identified. All eight plant species are listed and designated under the Province of Saskatchewan's *Weed Control Act* (Government of Saskatchewan 2010b). A summary of weed species observed is provided below in **Table 8-12**. Locations of the weed observations are presented in **Appendix G.**

Table 8-12: Weed Species Observed during Field Surveys Vegetation Community and Wetland Surveys in 2016 and 2017

Scientific Name[1]	Common Name	Weed Designation[2]	Observations within LAA
Arctium minus	common burdock	noxious	3
Cirsium arvense	Canada thistle	noxious	5
Elymus repens	creeping wild rye	nuisance	1
Hordeum jubatum ssp. *jubatum*	fox-tail barley	nuisance	11
Lactuca serriola	prickly lettuce	noxious	1
Salsola kali	Russian thistle	nuisance	1
Sonchus arvensis ssp. *arvensis*	field sow-thistle	noxious	1
Taraxacum officinale ssp. *officinale*	common dandelion	nuisance	2
Total			**25**

[1] Taxonomy based on the SKCDC 2020.

[2] Weed designations are from the Saskatchewan *Weed Control Act* (Government of Saskatchewan 2010b).

8.3 Project Interactions with Vegetation and Wetlands

The Project may interact with vegetation and wetlands during various physical activities, particularly during the construction decommissioning phases. These interactions may result in the environmental effects identified in **Table 8-1**. A summary of the interactions between specific Project activities and the vegetation and wetland VEC, and the potential effects that may result from these interactions, are identified below in **Table 8-13**.

Table 8-13: Summary of Project Interactions with Vegetation and Wetlands

Project Activities	Environmental Effects		
	Change in Vegetation Community Diversity	Change in Plant Species Diversity	Change in Wetland Area and Function
Construction Phase			
Site preparation, including vegetation clearing, topsoil stripping, grading and development of WTG locations, MET tower locations, access roads, substation and temporary workspaces	✓	✓	✓
Installation of WTG and MET tower foundations; erection of WTGs and MET towers	-	-	-
Installation of collector lines and substation infrastructure	✓	✓	✓
Post-construction reclamation of temporary workspaces	✓	✓	✓
Operation and Maintenance Phase			
Operation and use of WTGs, MET towers, substation and access roads	-	-	-
Routine and unplanned maintenance of WTGs	-	-	-
Routine and unplanned maintenance of collector lines, substation infrastructure and access roads	-	-	-
Decommissioning Phase			
Dismantling and removal or Project infrastructure, including WTGs, collector lines, substation infrastructure and access roads	✓	✓	✓
Site reclamation	✓	✓	✓

Note: ✓ denotes a potential interaction; – denotes no interaction.

8.4 Assessment of Residual Environmental Effects on Vegetation and Wetlands

8.4.1 Analytical Assessment Techniques

The assessment of potential environmental effects of the Project on vegetation and wetlands was completed by calculating and estimating the potential changes to the following measurable parameters that may be affected by the Project:

- Areal extent (ha) of native vegetation communities (e.g., grassland, broadleaf land cover classes);
- Population density and distribution of plant SOMC occurrences;

- Density and distribution of non-native invasive plant species populations; and
- Areal extent (ha) of wetlands.

8.4.2 Change in Vegetation Community Diversity

8.4.2.1 Effect Pathways

Construction Phase

Potential changes in vegetation community diversity by the Project are largely limited to the construction phase. Site preparation will require vegetation clearing and topsoil stripping for WTG locations, access roads, and substations within the PDA. Construction activities for the MET tower locations, temporary workspaces, and collector line system infrastructure will not require vegetation clearing or topsoil stripping, and would consist of vehicle traffic only. Disturbance or removal of vegetation in these areas could result in changes to the areal extent of native land cover classes (i.e., grassland, broadleaf, shrubland, wetlands and drainages) within the PDA.

Decommissioning Phase

The pathways for potential effects on vegetation community diversity by the Project during the decommissioning phase are similar to the construction phase. Project ac vi es during decommissioning may result in disturbance to or removal of vegeta on communi es within na ve vegeta on land cover classes. However, reclama on ac vi es in na ve land cover classes within the PDA using na ve plant species is an cipated to result in an increase in na ve vegeta on community diversity within the LAA.

8.4.2.2 Mitigation Measures

During the construction, operating and maintenance, and decommissioning phases of the Project, industry BMPs, avoidance of native land cover classes and site-specific mitigation measures will be implemented by OTW LP and contractors. The following mitigation measures will be implemented to address potential changes to vegetation community diversity:

- Native land cover classes (i.e., grassland, broadleaf, shrubland, wetlands and drainages) were avoided as much as possible during Project siting;
- Direct effects on native land cover classes will be further reduced during construction by micro-siting Project components and boundaries for Project activities to avoid these sensitive land covers classes to the extent possible;
- Boundaries of equipment and vehicle travel, and the extents of vegetation clearing will be clearly marked in native land cover classes prior to construction; no disturbance will be permitted in areas beyond these boundaries;
- An environmental monitor will be present during construction and reclamation activities in native land cover classes to provide site-specific recommendations to mitigate disturbance to sensitive areas, as required;

- Project activities on native land cover classes will occur during dry or frozen ground conditions to minimize ground disturbance;
- All vehicles and equipment will be equipped with spill response materials and firefighting equipment while on-site;
- Vegetation clearing will be limited to as minimal an area as possible;
- Where possible, shrub species will be "walked down" or travelled over rather than cleared, to preserve growth crowns and root networks, thereby enhancing regeneration following construction;
- All vehicles and equipment will arrive on-site in a clean and well-maintained condition, and will be free of leaks, oil and grease residue, soil clods and vegetative debris and propagules;
- Following construction, all temporary and non-operational workspaces will be reclaimed, with the objective of returning these areas to their equivalent pre-construction conditions;
- Following decommissioning, all Project infrastructure will be removed from the PDA, and the remaining disturbed areas in the PDA will be reclaimed to their equivalent pre-construction conditions;
- Where seeding will be required on native land cover classes during reclamation, only Certified Canada No. 1 seed may be used, with the Certificates of Analysis retained for documentation; and,
- Where best management practices and avoidance of native prairie is not possible, OTW LP will determine an appropriate approach to offset residual impacts following construction completion when the specific extent of those impacts are known.

Mitigation measures that will be implemented to address the potential effects of the Project on vegetation community diversity are provided in the EPP (see **Appendix C)**.

8.4.2.3 Predicted Residual Effects

Construction Phase

Native land cover classes comprise 1,030.6 ha of the LAA. Project activities during construction are anticipated to directly affect 9.4 ha of native land cover classes within the PDA, the majority of which (8.7 ha or 93%) will be temporarily affected during the construction phase through establishment of temporary workspaces that will receive low to moderate impacts. Following the completion of construction activities, these temporarily affected areas of the PDA will be passively or actively reclaimed to their equivalent pre-construction conditions. The remaining 0.7 ha of native land cover classes within the PDA will be affected by Project infrastructure that will be installed for the duration of Project operation (i.e., WTG pads, access roads, substation, overhead collector lines and MET towers). A summary of the areal extents of land cover classes that will be disturbed by the Project is provided in **Table 8-14**.

Table 8-14: Areal Extents of Land Cover Classes Disturbed by the Project

Land Cover Type	Cropland	Pasture/Forage	Grassland	Developed	Wetlands	Broadleaf	Drainage	Shrub	Total
Project Footprint (ha)									
WTG Pad	2.4	0.7	0.0	0.0	0.0	0.0	0.0	0.0	3.0
Access Roads	10.3	1.5	0.5	2.8	0.0	0.0	0.0	0.0	15.2
Substation	3.9	0.0	0.0	0.1	0.0	0.0	0.0	0.0	4.0
Collector Lines (Overhead)	0.2	0.2	0.2	2.2	0.0	0.0	0.0	0.0	2.7
MET Towers	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal Permanent Footprint	**16.8**	**2.3**	**0.7**	**5.1**	**0.0**	**0.0**	**0.0**	**0.0**	**25.1**
Temporary Workspace Areas (ha)									
WTG Workspace	63.1	18.1	0.0	0.1	0.0	0.1	0.0	0.0	81.3
Collector Lines (Underground)	14.2	3.2	4.9	0.3	0.5	0.1	0.1	0.1	23.3
Access Roads	17.1	3.5	1.8	0.1	0.1	0.1	0.0	0.0	22.7
Collector Lines (Overhead)	0.5	0.8	0.9	8.5	0.1	0.0	0.0	0.0	10.8
MET Towers	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3
Laydown Area	16.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.2
Subtotal Temporary Workspace	**114.3**	**25.5**	**7.6**	**9.0**	**0.6**	**0.3**	**0.1**	**0.1**	**157.5**
PDA Total	**131.2**	**27.9**	**8.3**	**14.1**	**0.7**	**0.3**	**0.1**	**0.1**	**182.5**

Note: ha = hectare.

Following the application of appropriate mitigation measures, the predicted residual effects on vegetation community diversity during construction are characterized below in **Table 8-15**.

Table 8-15: Characterization of Residual Effects on Vegetation Community Diversity during Project Construction

Criterion	Measure	Description
Direction	Adverse	The Project will result in a decrease in the areal extent of native land cover classes within the PDA, which will thereby decrease the diversity of vegetation communities.
Magnitude	Low	The Project will result in a measurable loss or alteration of native land cover classes within the PDA and potential for non-native invasive vegetative communities to extend into the LAA; however, OTW LP will determine an appropriate approach to offset the residual effects on vegetation community diversity following construction, when the actual extent of the effects are known.
Geographical Extent	PDA	Direct effects to vegetation community diversity as a result of Project activities during construction will be limited to the extents of the PDA.
Duration	Medium-term to long-term	Native land cover classes within temporary workspace areas will be affected throughout the construction phase and into the operation phase as these reclaimed areas are restored to an equivalent pre-construction land cover condition. Native land cover classes within the Project footprint (i.e., locations of long-term Project infrastructure) will be affected throughout the construction, operation and maintenance, and decommissioning phases, until post-decommissioning reclamation has been completed and the areas restored to an equivalent pre-construction land cover condition.
Frequency	Single event	Vegetation community diversity will be affected once, during the construction phase.
Effect	Reversible	The effect on vegetation community diversity will likely be reversed following post-construction and post-decommissioning reclamation.

<u>**Decommissioning Phase**</u>

Project effects on vegetation community diversity during the decommissioning phase are anticipated to be similar to those during the construction phase. Dismantling and removal of Project infrastructure will result in disturbance to native land cover classes that were reclaimed during the construction phase.

Upon completion of infrastructure dismantling and removal, disturbed areas within the PDA will be reclaimed to an equivalent land cover class (or other land cover class following consultation with the landowner). Therefore, while decommissioning activities will result in temporary changes or losses of vegetation community diversity, with the implementation of mitigation the resulting vegetation community diversity should be comparable to pre-construction conditions following the completion of post-decommissioning reclamation of the PDA.

Following the application of appropriate mitigation measures, the predicted residual effects on vegetation community diversity during decommissioning are characterized below in **Table 8-16**.

Table 8-16: Characterization of Residual Effects on Vegetation Community Diversity during Project Decommissioning

Criterion	Measure	Description
Direction	Adverse	The Project will result in a temporary decrease in the areal extent of native land cover classes within the PDA, which will thereby decrease the diversity of vegetation communities.
Magnitude	Low	The Project will result in a measurable loss or alteration of native land cover classes within the PDA, though the total affected area will be less than the construction phase, and small in the context of the LAA.
Geographical Extent	PDA	Direct effects to vegetation community diversity as a result of Project activities during construction will be limited to the extents of the PDA.
Duration	Medium-term	Effects to vegetation community diversity will extend beyond the decommissioning phase as the reclaimed areas are restored to an equivalent pre-construction condition.
Frequency	Single event	Vegetation community diversity will be affected once, during the decommissioning phase.
Effect	Reversible	Vegetation community diversity loss is likely to be reversed upon decommissioning and reclamation of the Project.

8.4.3 Change in Plant Species Diversity

8.4.3.1 Effect Pathways

Construction Phase

Potential changes in plant species diversity by the Project are largely limited to the construction phase. Site preparation will require vegetation clearing and stripping for WTG locations, MET tower locations, access roads, substations, temporary workspaces, and collector line system infrastructure within the PDA. Disturbance or removal of vegetation in these areas could result in localized changes to documented or undocumented plant SOMC population numbers and/or areas of occupancy.

Construction activities may also result in changes to plant species diversity through the introduction or spread of non-native invasive plant species, which may outcompete native plant species in the PDA or LAA, resulting in an overall decrease of plant species diversity.

Decommissioning Phase

The pathways for potential effects on plant species diversity by the Project during the decommissioning phase are similar to the construction phase. Vegeta on disturbance during decommissioning ac vi es in na ve land cover classes may result in changes to or losses of plant species diversity through removal of vegeta on species or introduc on or spread of non-na ve invasive plant species.

8.4.3.2 Mitigation Measures

During the construction, operation and maintenance, and decommissioning phases of the Project, industry BMPs, avoidance of native land cover classes and documented plant SOMC, and site-specific mitigation measures will be implemented by OTW LP and contractors. The following mitigation measures will be implemented to address potential changes to plant species diversity:

- Native land cover classes (i.e., grassland, broadleaf, shrubland, wetlands and drainages) and documented plant SOMC occurrences were avoided as much as possible during Project siting;
- Direct effects on plant SOMC will be further reduced during construction by micro-siting Project components and boundaries for Project activities to avoid native land covers classes and maintain a 30 m setback distance from plant SOMC to the extent possible;
- Plant SOMC and their 30 m setback distances will be clearly marked for avoidance by construction activities and equipment travel;
- In the event that avoidance of all identified plant SOMC in the PDA is not feasible, OTW LP will contact ENV and discuss appropriate mitigation measures to reduce the potential effects of the Project on the specific SOMC occurrences (e.g., schedule activities outside of the growing season, placement of matting or other protective barriers over the plant populations);
- An environmental monitor will be present during construction and reclamation activities in the vicinity of documented plant SOMC and will inspect areas of the PDA located on native land cover classes prior to construction to identify and stake plant SOMC populations and applicable setbacks for avoidance, as required;
- Project activities on native land cover classes will occur during dry or frozen ground conditions to minimize disturbance to native plant species;
- All vehicles and equipment will be equipped with spill response materials and firefighting equipment while on-site;
- Vegetation clearing will be limited to as minimal an area as possible;
- Where possible, shrub species will be “walked down” or travelled over rather than cleared, to preserve growth crowns and root networks, thereby enhancing regeneration following construction;
- All vehicles and equipment will arrive on-site in a clean and well-maintained condition, and will be free of leaks, oil and grease residue, soil clods and vegetative debris and propagules;
- Prior to construction, the PDA will be inspected for noxious or prohibited weeds, as designated under *The Weed Control Act* (Government of Saskatchewan, 2010b). Where identified, areas of weed infestation will be documented, marked on-site, communicated to on-site Project personnel, and avoided where possible;

- In the event that previously unidentified plant SOMC are found during construction, appropriate site-specific mitigation measures will be implemented, following discussions between OTW LP, the environmental monitor and ENV;
- Where avoidance of areas of weed infestation is not possible, topsoil stripped from infested areas will be salvaged and stockpiled separately from other stockpiles to avoid unnecessarily spreading weed propagules into non-infested areas of the site;
- Equipment used for stripping soil from areas of known noxious weed infestation should be diligently cleaned with hand tools (i.e., shovels, brooms), compressed air, or using a dedicated wash station, as appropriate, to prevent unnecessarily spreading weed propagules into non-infested areas of the site;
- Aggregate or other fill material required for construction will be sourced from areas free of noxious or invasive weeds;
- Access matting or other similar barriers will be used in areas of weed infestation that cannot be avoided by vehicle or equipment traffic, as appropriate, to limit the spread of infestation;
- Weed growth on stockpiled topsoil will be monitored during the course of construction, and mitigation measures (e.g., spraying) will be conducted as appropriate;
- The PDA will be inspected for the presence of noxious or prohibited weeds throughout the construction phase. In the event that, despite best management practices, weeds are inadvertently introduced to the PDA during construction, Project personnel will immediately remove them through standard management practices. Weed control by mechanical (i.e., mowing, hand-pulling) or chemical (i.e., spraying) treatment will be undertaken as required. Chemical treatment will be completed by provincially licensed personnel approved by OTW LP.
- Soil piles that are present on site for more than 30 days will be covered or stabilized with seeding and/or sod to reduce soil erosion ;
- Topsoil will be stripped and stored separately from underlying soil layers;
- Transportation of materials will be properly secured and covered to reduce the loss of materials during transportation;
- Dust control will be implemented when deemed necessary;
- Following construction, all temporary and non-operational workspaces will be reclaimed, with the objective of returning these areas to their equivalent pre-construction conditions;
- Following decommissioning, all Project infrastructure will be removed from the PDA, and the remaining disturbed areas in the PDA will be reclaimed to their equivalent pre-construction conditions; and
- Where seeding will be required on native land cover classes during reclamation, only Certified Canada No. 1 seed may be used, with the Certificates of Analysis retained for documentation.

8.4.3.3 Predicted Residual Effects

Construction Phase

No federally listed plant SOMC or designated critical habitat were identified in the PDA or LAA during the desktop review or field surveys; therefore, federally listed plant species are not anticipated to be affected by the Project.

The 2016, 2017 and 2019 field surveys identified 19 plant SOMC at 109 locations within the LAA. Of these, 9 SOMC were observed in 28 locations within the 30 m setback distance but outside of the PDA, and 6 SOMC were observed in 15 locations within the PDA boundary (see **Table 8-10**). The plant SOMC identified within the PDA may be affected by construction activities; however, 13 of the 15 observation locations within the PDA are located along infrastructure corridors (i.e., underground and overhead collector lines and access roads). These project components can likely be realigned during final Project design to avoid the observed plant SOMC occurrences, or avoided through micro-siting the Project components on-site. The two remaining plant SOMC observed within the PDA are a population of sandhills cinquefoil (*Potentilla lasiodonta*; 50 individuals) and a population of white milkwort (*Polygala alba*; 50 individuals), which are located within the temporary WTG construction workspace in SE-09-03-24-W2M, within pasture/forge land cover. These plant SOMC will be avoided during final Project design, if possible. If they cannot be avoided during final Project design, the extents of the SOMC populations will be staked on-site prior to construction, and these areas will be avoided by micro-siting Project components accordingly. In the event that all identified plant SOMC cannot be avoided during final Project design or micro-siting Project components, OTW LP and the environmental monitor will contact ENV to discuss appropriate mitigation measures to reduce the effects of the Project on the specific SOMC occurrences (e.g., limit construction in areas of occupancy to winter periods when plants have senesced or set seed, placement of matting or other protective barriers over the plant populations). With proper planning, consideration of field survey findings during final Project design and the application of appropriate mitigation measures, plant SOMC are not anticipated to be directly affected by the Project.

Eight non-native invasive plant species were documented during the 2016 and 2017 vegetation community and wetland surveys, including four noxious and four nuisance species (see **Table 8-12**). The most common species identified during the surveys were foxtail barley (*Hordeum jubatum*) and Canada thistle (*Cirsium arvense*), designated as nuisance and noxious weed species under *The Weed Control Act* (Government of Saskatchewan 2010b), respectively. Both of these species are early invaders of disturbed lands, and can quickly establish dense populations through prolific seed production and dispersal. Therefore, areas disturbed by Project activities will be reclaimed as quickly as feasible to limit the potential for non-native invasive plant species to establish or spread within the PDA.

Construction activities also have the potential to introduce non-native invasive plant species into new areas of the PDA, particularly when vehicles and equipment travel from locations with known occurrences of these species, and because these species may be prevalent in areas beyond the LAA.

Proper planning, avoidance of known populations, and implementation of the previously outlined mitigation measures will effectively reduce the potential effects of non-native invasive plant species on plant species diversity within the PDA.

Following the application of appropriate mitigation measures, the predicted residual effects on plant species diversity during construction are characterized below in **Table 8-17**.

Table 8-17: Characterization of Residual Effects on Plant Species Diversity during Project Construction

Criterion	Measure	Description
Direction	Adverse	A decrease in plant species diversity may occur through the loss of unidentified plant SOMC and the possible introduction and/or spread of non-native invasive plant species.
Magnitude	Low to Moderate	The Project may result in a measurable change in plant species diversity through a decrease in previously unidentified plant SOMC within the PDA, and a measurable increase in non-native invasive plant species within the PDA, with the potential to extend into the LAA.
Geographical Extent	PDA/LAA	Plant species diversity may be subject to direct effects through loss of unidentified plant SOMC within the PDA, as well as indirect effects by non-native invasive species that may extend into the LAA.
Duration	Long-term	The duration of Project effects resulting from the loss of unidentified plant SOMC will extend beyond the life of the Project, while the effects resulting from introduction and spread of non-native invasive species will continue into the operation phase.
Frequency	Single Event	Project effects on plant species diversity will be affected once, during the construction phase.
Reversibility	Reversible	Project effects on plant species diversity are likely to be reversed upon decommissioning and reclamation of the Project.

Decommissioning Phase

Decommissioning activities are anticipated to have a reduced effect on plant species diversity overall, as activities will be largely restricted to developed areas within the PDA. However, dismantling and removal of Project infrastructure will result in disturbance to some previously reclaimed native land cover classes that make affect plant species diversity.

Upon completion of infrastructure dismantling and removal, disturbed areas within the PDA will be reclaimed to an equivalent land cover class (or other land cover class following consultation with the landowner). Unless otherwise directed by landowners, native land cover classes will be reclaimed using native plant seed mixes or allowing natural regeneration of local native species. Furthermore, appropriate mitigation measures to manage non-native invasive plant species within the PDA will be implemented throughout the decommissioning and reclamation activities.

Following the application of appropriate mitigation measures, the predicted residual effects on plant species diversity during decommissioning are characterized below in **Table 8-18**.

Table 8-18: Characterization of Residual Effects on Plant Species Diversity during Project Decommissioning

Criterion	Measure	Description
Direction	Adverse	A decrease in plant species diversity may occur through the loss of unidentified plant SOMC and the possible introduction and/or spread of non-native invasive plant species.
Magnitude	Low	The Project is not likely to result in a measureable change in plant species diversity through a decrease in previously unidentified plant SOMC, as decommissioning activities will be largely restricted to developed and previously disturbed areas within the PDA; however, these activities may result in a measureable increase in non-native invasive plant species within the PDA.
Geographical Extent	PDA/LAA	Plant species diversity may be subject to direct effects through loss of unidentified plant SOMC within the PDA, as well as indirect effects by non-native invasive species that may extend into the LAA.
Duration	Long-term	The duration of Project effects resulting from the loss of unidentified plant SOMC will extend beyond the decommissioning phase, while the effects resulting from introduction and spread of non-native invasive species will continue throughout the decommissioning phase.
Frequency	Single event	Project effects on plant species diversity will be affected once, during the decommissioning phase.
Reversibility	Reversible	Project effects on plant species diversity are likely to be reversed upon decommissioning and reclamation of the Project.

8.4.4 Change in Wetland Area and Function

8.4.4.1 Effect Pathways

Construction Phase

Potential changes in wetland area and function by the Project are largely limited to activities completed during the construction phase. For the purposes of the effects assessment, wetlands also refer to drainages, because the potential effects and effects pathways are similar for both wetlands and drainages within the PDA and LAA. The area and/or function of wetlands could be affected by topsoil stripping and grading activities within or near wetlands during site preparation, which could reduce the total wetland area or alter wetland function through sedimentation. Construction or installation of Project components may also affect wetland area and function through ground disturbance within or adjacent to wetland boundaries. Moreover, vehicle and equipment travel within or adjacent to wetlands could disturb the wetland substrate and wetland vegetation communities, which in turn may result in changes to wetland area and function by altering drainage patterns, infiltration and water uptake.

Spills or releases of fuels, lubricants or other hazardous materials within or adjacent to wetlands may also affect wetland function.

Decommissioning Phase

The pathways for potential effects on wetland area and function by the Project during the decommissioning phase are consistent with those during the construction phase.

8.4.4.2 Mitigation Measures

During the construction, operation and maintenance, and decommissioning phases of the Project, avoidance of wetlands and implementation of industry BMPs and site-specific mitigation measures will address potential changes to wetland area and function as result of the Project. Project-specific mitigation measures that will be implemented include the following:

- Wetlands identified within the PDA will be avoided to the extent possible during final Project design;
- Wetland boundaries, plus an appropriate setback distance, will be clearly marked within the PDA for avoidance prior to construction;
- In the event that wetlands cannot be avoided by construction activities, OTW LP will submit an Aquatic Habitat Protection Permit application to the Saskatchewan Water Security Agency, in which site-specific measures will be described to mitigate disturbance to wetlands. No disturbance to wetlands will occur without prior regulatory approval;
- All work occurring in or around wetlands will be scheduled for dry or frozen conditions;
- If work is required during wet conditions, additional mitigation measures will be implemented to avoid soil compaction and admixing, including installation of matting or geotextile materials, and the use of high surface area, low ground pressure equipment;
- An environmental monitor will be present for all construction and reclamation activities within wetlands;
- Appropriate erosion and sediment control measures (e.g., sediment fencing, check dams, matting) will be implemented to prevent sediment transfer from construction areas into wetlands;
- Erosion and sediment control measures will installed under the supervision of the environmental monitor or other qualified personnel;
- Where collector lines cannot be re-routed to avoid wetlands, they will be avoided using horizontal directional drilling installation (for underground collector lines) or spanning across the wetland (for overhead collector lines);

- Culverts will be installed at designated water crossings to mimic natural drainage patterns and maintain flow;
- Any disturbance to wetland areas (e.g., rutting, soil compaction) will be promptly repaired and documented by the environmental monitor, and will be monitored to ensure successful natural recovery or actively reclaimed using appropriate native plant species;
- All refuelling and maintenance of vehicles and equipment will be conducted a minimum of 100 m from all wetlands and watercourses and avoid all other natural lands.
- A spill response plan will be implemented to address and document all spill and release events during construction.
- All fuel storage and refuelling activities will be completed at a minimum distance of 100 m from any wetland;

Additional mitigation measure to address the potential changes in wetlands are provided in detail in the EPP in **Appendix C**.

8.4.4.3 Predicted Residual Effects

The PDA has been designed to avoid wetlands to the extent possible; as such, the PDA intersects with approximately 0.7 ha of wetland and drainage land cover classes, which comprises approximately 0.7% of wetlands and drainages in the LAA (see **Table 8-11**). The 0.7 ha of wetlands within the PDA are intersected by temporary workspace areas (i.e., temporary workspaces for access roads, overhead and underground collector lines) during the construction phase (see **Table 8-14**); no permanent infrastructure will be installed or developed within wetland areas. Further, temporary workspaces will be sited and collector lines will be installed to avoid wetland areas entirely.

By avoiding all wetland areas within the PDA through siting of Project components and selecting appropriate installation methods for collector lines, no direct effects to wetland area and function are anticipated. Further, through the application of industry BMPs and mitigation measures provided in **Section 8.4.2.2**, no indirect effects to wetland area and function from adjacent Project activities are anticipated during the construction, operation, and maintenance, and decommissioning phases. Therefore, no residual effects to wetland area and function from the Project are anticipated.

8.5 Assessment of Cumulative Environmental Effects on Vegetation and Wetlands

The assessment of Project-specific effects on the vegetation and wetlands VEC described in **Section 8.4** determined that, after applying the appropriate mitigation measures, the following residual effects will likely remain as a result of the Project:

- Change in vegetation community diversity; and
- Change in plant species diversity.

These residual effects are measurable for the Project and may act in a cumulative manner with the potential adverse residual effects of other past, present, or reasonably foreseeable or publicly known future projects or physical activities within the RAA. The potential residual effects from these other projects and activities that may interact with the Project-specific residual effects are predicted based on publicly available information, and information that was presented in the Project TPP. An assessment of these potential cumulative interactions is provided in this section, in which the cumulative effect pathways are identified, mitigation measures to address cumulative effects are proposed and the resulting residual cumulative effects (where identified) are described and evaluated for significance.

8.5.1 Projects and Activities Included in the Cumulative Effects Assessment

As described in **Section 4.4.3**, a project and activity inclusion list was developed for the cumulative effects assessment (see **Table 4-3**), which includes other past, present and reasonably foreseeable projects and physical activities with residual effects that could overlap spatially and temporally with the Project-specific residual effects. Interactions between Project-specific residual effects on the vegetation and wetlands VEC and the predicted residual effects of other projects and activities in the RAA that may contribute to cumulative effects are provided in **Table 8-19**.

Table 8-19: Interactions with Potential to Contribute to Cumulative Effects on Vegetation and Wetlands within the RAA

Project or Activity in RAA with Potential to Interact Cumulatively with the Project	Project-Specific Residual Environmental Effects	
	Change in Vegetation Community Diversity	Change in Plant Species Diversity
Past and Present Projects and Activities		
Agricultural Conversion	✓	✓
Residential Development	✓	✓
Recreational Activities	-	-
Oil and Gas Development	✓	✓
Road and Rail Development	✓	✓
Power Generation, Transmission and Distribution	✓	✓
Poplar River Power Station	✓	✓
Resource Extraction Activities	✓	✓
Poplar River Coal Mine	✓	✓
Future Projects and Activities		
SaskPower Interconnection Transmission Line to the Project	✓	✓

Note: ✓ denotes a potential cumulative interaction; – denotes no anticipated cumulative interaction.

8.5.2 Change in Vegetation Community Diversity

8.5.2.1 Cumulative Effect Pathways

The predicted Project-specific residual effects on vegetation community diversity may act in a cumulative manner with other past, present or future projects and activities in the RAA that are also likely to affect vegetation community diversity. The mechanisms by which other past, present or future projects or activities may affect vegetation community diversity are similar to those of the Project (e.g., vegetation clearing and ground disturbance in native land cover classes), and are anticipated to be largely limited to the construc on phases of the projects.

8.5.2.2 Mitigation Measures for Cumulative Effects

A range of Project-specific mitigation measures will be implemented to address changes to vegetation community diversity within the PDA and LAA. Opportunities to implement coordinated mitigation programs among other projects or activities in the RAA are limited, due to timing constraints, geographic separation and uncertainty of other project activities. However, many of the current and future projects and activities are required by their respective regulatory approvals to implement site-specific mitigation and follow industry BMPs to reduce potential effects on the environment, including vegetation community diversity.

8.5.2.3 Residual Cumulative Effects

The dominant land cover class within the RAA is grassland, which exists in large intact areas associated with the Big Muddy Valley. Grasslands account for 37,271.1 ha or 49.8% of the RAA, and all native land cover classes collectively account for 40,631.1 ha or 54.3% of the RAA. Nonetheless, a large portion of the RAA has been extensively affected by land conversion for agricultural land use, with cropland and pasture/forage land cover classes collectively accounting for 30,833 ha or 41% of the RAA. Based on the criteria used to characterize residual effects on vegetation and wetlands (see **Table 8-4**), the magnitude of effects on vegetation community diversity by previous and existing projects and activities in the RAA is high, and can be primarily attributed to agricultural conversion of native land cover.

The Project is anticipated to have a minimal cumulative effect on vegetation community diversity in the RAA, with 9.4 ha of native land cover classes anticipated to be affected during construction, which accounts for 0.9% of the 1,030.6 ha of native land cover classes in the LAA. Further, effects on the majority of native land cover classes within the PDA (8.7 ha) will occur during the construction phase through establishment of temporary workspace areas (i.e., temporary workspaces support construction of access roads and collector lines). Following the completion of construction activities, these temporarily affected areas of the PDA will be reclaimed to their equivalent pre-construction conditions. The remaining 0.7 ha of native land cover classes within the PDA will be affected by Project infrastructure that will be installed for the duration of Project operation (i.e., WTG pads, access roads, substation, overhead collector lines and MET towers).

Other projects in the RAA, including the continued expansion of the Poplar River Coal Mine and the potential SaskPower interconnection transmission line that will be constructed to connect the Project to the existing power grid, are expected to contribute to cumulative effects on vegetation community diversity. The Poplar River Coal Mine Expansion project will result in the removal of 472 ha of native prairie habitat and 8 ha of wetlands (ENV 2011), representing 1.2% of native land cover classes within the RAA. The specific siting of SaskPower's potential interconnection transmission line are not yet known at the time of EIS writing; therefore, the extent of potential effects to vegetation community diversity by this project cannot be quantified. However, SaskPower has developed a suite of BMPs in consultation with ENV, to which all SaskPower construction projects are bound to comply. Further, the interconnection transmission line project will be subject to an environmental assessment, in which the potential effects on the environment will be evaluated and managed through project-specific mitigation. Therefore, it is reasonable to assume that this project will have a minimal cumulative effect on vegetation community diversity within the RAA.

The total cumulative change in vegetation community diversity by the Project in combination with the Poplar River Coal Mine Expansion project will amount to 489.4 ha or 1.2% of native land cover classes within the RAA.

8.5.3 Change in Plant Species Diversity

8.5.3.1 Cumulative Effect Pathways

The predicted Project-specific residual effects on plant species diversity may act in a cumulative manner with other past, present or future projects and activities in the RAA that are also likely to affect plant species diversity. The mechanisms by which other past, present or future projects or activities may affect plant species diversity are similar to those of the Project (e.g., vegetation clearing and ground disturbance in areas that support high plant species diversity, introduction or spread of non-native invasive plant species).

8.5.3.2 Mitigation Measures for Cumulative Effects

A suite of desktop reviews and field surveys have been completed for the Project, which has contributed to increased confidence in the locations of plant SOMC and areas with high potential to encounter plant SOMC in the LAA. A range of Project-specific mitigation measures will be implemented to address changes to plant species diversity within the PDA and LAA. Opportunities to implement coordinated mitigation programs among other projects or activities in the RAA are limited due to timing constraints, geographic separation and uncertainty of other project activities. However, many of the current and future projects and activities in the RAA are required by their respective regulatory approvals to implement site-specific mitigation and follow industry BMPs to reduce potential effects on the environment, including plant species diversity. These mitigation measures include a requirement for pre-construction vegetation surveys in areas of native land cover, and management of non-native invasive plant species.

8.5.3.3 Residual Cumulative Effects

A large portion of the RAA has been extensively affected by land conversion for agricultural land use, with cropland and pasture/forage land cover classes collectively accounting for 30,833 ha or 41% of the RAA. However, grassland remains the dominant land cover class within the RAA, which exists in large intact areas associated with the Big Muddy Valley. Grasslands, along with other native land cover classes, provide suitable habitat to support plant SOMC, and the continued conversion of these land cover classes has contributed to more plant species becoming designated as SOMC.

The vegetation field surveys completed for the Project identified 9 plant SOMC in 28 locations within a 30 m setback distance of the PDA, and 6 plant SOMC 15 locations within the PDA boundary (see **Table 8-10**). However, with proper planning, consideration of field survey findings during final Project design and the application of appropriate mitigation measures, plant SOMC are not anticipated to be directly affected by the Project.

Other projects and activities in the RAA, including the continued expansion of the Poplar River Coal Mine and the potential SaskPower interconnection transmission line that will be constructed to connect the Project to the existing power grid, are expected to contribute to cumulative effects on plant species diversity through disturbance of native land cover classes where plant species diversity is high. Based on information provided by ENV that was included in the Project TPP (**Section 6.1.2** of the TPP), activities associated with Poplar River Coal Mine Expansion project will affect populations of six plant SOMC within the RAA. The siting of SaskPower's potential interconnection transmission line are not yet known at the time of EIS writing; as such, the potential effects on plant SOMC cannot be determined.

The vegetation surveys completed for the Project also identified eight non-native invasive plant species within the LAA, including four noxious and four nuisance species (see **Table 8-12**). These and other non-native invasive plant species have the potential to decrease plant species diversity by encroaching upon and outcompeting native species in diverse vegetation communities areas within the LAA. Due to the large proportion of disturbed land within the RAA and ubiquitous presence of non-native invasive species throughout the province, it is reasonable to assume that non-native invasive species populations are likely prevalent throughout the RAA, and contribute to effects on plant species diversity on a regional scale.

8.5.4 Summary of Residual Cumulative Effects on Vegetation and Wetlands

The residual cumulative environmental effects on the vegetation and wetlands VEC are summarized in **Table 8-20**.

Table 8-20: Characterization of Residual Cumulative Effects

Criterion	Measure of Residual Cumulative Effect	Contribution from the Project to the Residual Cumulative Effect
Residual Cumulative Change in Vegetation Community Diversity		
Direction	Adverse	The Project will result in changes to or loss of 9.4 ha of native land cover classes, which will thereby decrease vegetation community diversity in the RAA.
Magnitude	High	The Project will result in changes to or loss of 9.4 ha of native land cover classes, which represents less than 0.1% of native land cover classes in the RAA. This Project-specific residual effect will have a negligible contribution to the residual cumulative effect, as the magnitude of residual cumulative effects on vegetation community diversity from past and present land conversion for agricultural use in the RAA is already considered high.
Geographical Extent	RAA	The Project's contribution to the residual cumulative change in vegetation community diversity will be limited to extents of the PDA.
Duration	Permanent	Project contributions to changes to vegetation species diversity will largely occur throughout the construction phase and into the operation phase as temporary workspaces are reclaimed following construction. Native land cover classes within the Project footprint (i.e., locations of long-term Project infrastructure) will be affected throughout the construction, operation and maintenance, and decommissioning phases, until post-decommissioning reclamation has been completed and the areas restored to an equivalent pre-construction land cover condition.
Frequency	Multiple irregular events	Vegetation community diversity will be affected once by the Project, during the construction phase.
Reversibility	Irreversible	Cumulative changes in vegetation community diversity in the RAA are irreversible; however, effects on vegetation community diversity by the Project will likely be reversed following post-construction and post-decommissioning reclamation.
Residual Cumulative Change in Plant Species Diversity		
Direction	Adverse	The Project may result in a decrease in plant species diversity in the RAA through the loss of unidentified plant SOMC and the possible introduction and/or spread of non-native invasive plant species.
Magnitude	High	The Project will result in changes to or loss of 9.4 ha of native land cover classes that provide suitable habitat potential for plant SOMC, which represents less than 0.1% of suitable habitat potential for plant SOMC in the RAA. This Project-specific residual effect will have a negligible contribution to the residual cumulative effect, as the magnitude of effects on plant species diversity from past and present land conversion for agricultural use in the RAA is already considered high.

Criterion	Measure of Residual Cumulative Effect	Contribution from the Project to the Residual Cumulative Effect
Geographical Extent	RAA	The Project's contribution to the residual cumulative change in plant species diversity will be limited to extents of the PDA.
Duration	Permanent	The duration of Project effects resulting from the loss of unidentified plant SOMC will extend beyond the life of the Project, while the effects resulting from introduction and spread of non-native invasive species will continue into the operation phase.
Frequency	Multiple irregular events	Project effects on plant species diversity will be affected once, during the construction phase.
Reversibility	Irreversible	Cumulative changes to plant species diversity in the RAA are irreversible; however, effects on plant species diversity by the Project will likely be reversed following post-construction and post-decommissioning reclamation.

8.6 Determination of Significance

8.6.1 Significance of Project-Related Residual Effects

Overall, the predicted residual effects on vegetation and wetlands are anticipated to be adverse, low in magnitude, limited to the extents of the PDA, long-term in duration, occur as single events (i.e., during construction or decommissioning phases) and reversible through reclamation. The effects have been largely addressed during Project design by avoiding native land cover classes, and through implementation of appropriate mitigation measures when avoidance is not possible. Therefore, based on the significance definition criteria provided in **Section 8.1.6**, the residual effects on vegetation and wetlands are predicted to be not significant.

8.6.2 Significance of Cumulative Effects

The existing conditions within the RAA reflect a landscape that has been extensively and irreversibly modified by the conversion of native land cover for agricultural use. Based on the measures used to define magnitude in **Table 8-4**, and the criteria used to determine the signi cance of e ects in **Section 8.1.6**, cumula ve e ects on the Vegeta on and Wetlands VEC from previous and ongoing ac vi es in the RAA are high in magnitude and signi cant. As such, the Project-speci c residual e ects are an cipated to have a negligible contribu on to the cumula ve e ects.

8.7 Prediction Confidence

Based on the information collected during the desktop analysis, observations during field surveys, and the Project team's understanding of Project activities, the predicted confidence in the assessment of potential effects of the Project on vegetation and wetlands is moderate to high. Some uncertainty exists in the exact degree of change in land cover classes and plant species diversity that will occur during Project construction, as additional opportunities for avoidance of sensitive vegetation and wetland areas within the PDA may be determined by the construction contractor at the onset of construction. However, there is a high level of confidence in the effectiveness of the mitigation measures proposed in **Section 8.4** for each of the potential residual effects.

8.8 Follow-Up and Monitoring

OTW LP will retain the services of an environmental monitor during construction to evaluate the effectiveness of the mitigation measures related to vegetation and wetlands, and to ensure that the mitigation measures and procedures included in the EPP (see **Appendix C**) are being followed. Similarly, the PDA will be monitored following construction and decommissioning, to evaluate the effectiveness of reclamation activities.

9.0 Assessment of Potential Effects on Wildlife and Wildlife Habitat

9.1 Scope of Assessment

The wildlife and wildlife habitat VEC represents all the wildlife and their associated habitats that are found within the broader ecoregion, including wildlife SOMC. Wildlife and wildlife habitat was included as a VEC in the EIS as they contribute to the biodiversity and proper functioning of the natural ecosystems, provide multiple values to humans, and have inherent value as natural species on the landscape. Wildlife and wildlife habitat are vital components of a functional natural ecosystem; changes in wildlife species abundance or diversity, or losses of available wildlife habitat can result in changes to the overall function of an ecosystem, which in turn can adversely affect the ability of humans to enjoy or benefit from these natural resources.

The potential for direct effects through collision mortality and loss of habitat, and through indirect effects on habitat suitability are important considerations for wind energy projects. As such, the potential for both direct and indirect effects of the Project on wildlife and wildlife habitat are evaluated in this section. The interrelation between wildlife habitat and the vegetation and wetlands VEC are evident in that wildlife habitat is a function of the broader ecosystem components. As such, potential changes in the vegetation and wetlands VEC are also captured in this VEC through potential changes to wildlife habitat.

9.1.1 Regulatory and Policy Setting

9.1.1.1 Federal Regulatory Requirements

The federal *Species at Risk Act, 2002* (SARA; Government of Canada 2002) protects Schedule 1 extirpated, endangered and threatened wildlife species and their critical habitat on Federally-regulated lands (i.e., Crown land). Under Section 32(1) of the SARA: *"No person shall kill, harm, harass, capture or take an individual of a wildlife species that is listed as an extirpated species, an endangered species or a threatened species."* Under Section 58(1) of the SARA: *"No person shall destroy any part of the critical habitat of any listed endangered species or of any listed threatened species – or of any listed extirpated species if a recovery strategy has recommended the reintroduction of the species into the wild in Canada."* Wildlife species are assessed and provided designation recommendations by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). These designations are recommended by COSEWIC and are provided legal protection under SARA. Wildlife SAR are defined as the species listed under Schedule 1, Schedule 2 or Schedule 3 of the SARA, or designated as Special Concern, Threatened or Endangered under COSEWIC (Government of Canada 2002).

The federal *Migratory Birds Convention Act, 1994* (MBCA; Government of Canada 1994) was established to provide legislative protection for migratory bird populations, individuals and occupied nests in Canada. Under Section 5 of the MBCA: "*No person shall, without lawful excuse, be in possession of a migratory bird or nest*." Birds protected by the MBCA are detailed in Article I, those not listed under Article I may be protected under provincial legislation (Government of Canada 1994).

The federal *Migratory Birds Regulations* (Government of Canada 2018) are enabled by the MBCA. According to Section (6) of the *Migratory Bird Regulations*, the disturbance, destruction or taking of a migratory bird nest, egg, nest shelter, eider duck shelter or duck box, or the possession of a live migratory bird, or a carcass, skin, nest or egg of a migratory bird are prohibited without authorization of a permit.

9.1.1.2 Provincial Regulatory Requirements

The provincial *Wildlife Act*, 1998 (Government of Saskatchewan 1998) protects designated species (i.e., those listed as extirpated, endangered, threatened or vulnerable). Under Section 51(1)a of The Wildlife Act: *"No person shall kill, injure, possess, disturb, take, capture, harvest, genetically manipulate or interfere with or attempt to do any of those things to any designated species."* The SKCDC evaluates and assigns conservation ranks (S-Rank) to wildlife species in the Province of Saskatchewan. This conservation ranking process is based off of review of the SKCDC database, scientific and government literature, publications, consultation with experts and field work. Conservation statuses are based off of the rarity of a species, the population trend and the overall threat of the species. Conservations ranking is from S5: secure/common to S1: critically imperiled/extremely rare. In the Province of Saskatchewan, wildlife SOMC include the species designated as S3: vulnerable/rare to uncommon, S2: imperiled/very rare and S1: critically imperiled/extremely rare (SKCDC 2019a).

The provincial *Wildlife Regulations, 1981* includes additional protection for specific wildlife features. Under Section 6(1) of the Wildlife Regulations: "*No person shall, without a license for the purpose, interfere with any wildlife or place of habitation of any wildlife protected pursuant to the Act, any regulations made pursuant to the Act, the Migratory Birds Convention Act, 1994 or any regulations made pursuant to that Act*" (Government of Saskatchewan 1981).

The Provincial *Wildlife Habitat Protection Act, 1992* (WHPA; Government of Saskatchewan 1992) designates Crown lands as wildlife habitat lands. Under Section 7(1) of the WHPA: "*No person shall alter wildlife habitat and ecological lands unless the alteration is permitted in the regulations or authorized by the minister*."

The ENV provides an additional resource for siting wind projects. The *Wildlife Siting Guidelines for Saskatchewan Wind Energy Projects* document details applicable regulatory frameworks, risks that wind projects impose to wildlife species, wind project avoidance zones, pre-construction planning including applicable wildlife surveys and considerations to avoid wildlife impacts (ENV 2019).

The *Saskatchewan Activity Restriction Guidelines for Sensitive Species* provides recommended setback distances for Saskatchewan wildlife species and key wildlife habitat features based on disturbance categories (ENV 2017).

9.1.2 Consideration of Issues Raised During Engagement

During the consultation and engagement program completed for the Project (see **Section 3.0**), several concerns were raised that pertained to wildlife and wildlife habitat. These issues, as well as a summary of the issues pertaining to wildlife and wildlife habitat identified in the Ministerial Determination are as follows.

Potential effects to wildlife habitat were raised at several meetings with ENV and NGOs, both directly as concerns to wildlife habitat and indirectly through impacts to natural vegetation communities (see **Section 8.0**). Concerns about wildlife habitat were reflected primarily in the potential direct and indirect impacts to native prairie in the Project area. These concerns were addressed through the multiple years of wildlife surveys to identify sensitive wildlife features (see **Section 9.2**) that were avoided wherever possible, as well as through revisions to the final layout that have substantially reduced the area of the PDA and permanent footprint of the Project in areas of native prairie. This has been demonstrated in **Section 9.4.2**.

Potential effects to wildlife mortality risk were raised during engagement meetings and open houses over the course of the Project development. This has been considered in revisions to the Project through selection of larger turbine models, which are likely to reduce the overall mortality risk to wildlife from the Project (see **Section 9.4.3**). With the issuance of the *Adaptive Management Guidelines for Saskatchewan Wind Energy Projects* (ENV 2018), during engagement meetings with stakeholders and interested parties, concerns over mortality risk were addressed through explanation that mortality rate thresholds triggering adaptive management processes were required as part of new wind energy projects in Saskatchewan. These guidelines, given the more recent scientific evidence suggesting that mortality risk to birds and bats cannot be accurately predicted, have generally been well received and have addressed the concerns of parties related to this effect.

9.1.3 Potential Effects, Pathways and Measureable Parameters

The Project has the potential to result in changes to wildlife habitat availability and mortality risk, which are the primary effects that were considered in the assessment of potential effects of the Project on the wildlife and wildlife habitat VEC. Due to their inherent vulnerability by definition, and the existence of specific regulations and legislative policies, wildlife SAR and SOMC are the focus of the assessment of potential effects on wildlife and wildlife habitat by the Project.

The species groups included in the definition of wildlife SOMC include provincially and federally-listed SAR, as well as those included on provincial tracking lists and activity restriction guidelines, including the following groups:

- Species listed under *The Wildlife Act* of Saskatchewan (1998) as endangered, threatened or vulnerable;
- Listed by the COSEWIC as endangered, threatened, or special concern (Government of Canada 2020b);
- Assigned a ranking of S1 or S2 (or a combination of these rankings) by the SKCDC (SKCDC 2019a); and
- Included in the *Saskatchewan Activity Restriction Guidelines for Sensitive Species* (ENV 2017).

The pathways of the potential effects on wildlife and wildlife habitat, and the parameters by which these effects can be measured are provided below in **Table 9-1**.

Table 9-1: Potential Effects, Pathways and Measurable Parameters for Wildlife and Wildlife Habitat

Potential Effect	Effect Pathways	Measurable Parameters
Change in wildlife habitat availability	Loss or degradation of habitat for wildlife species will reduce the capacity of the landscape to sustain populations of wildlife within the PDA, LAA and/or RAA.	Areal extent (ha) of loss or degradation of natural land cover types
	The Project may result in a reduced suitability of wildlife habitat indirectly through noise and other disturbance mechanisms. This pathway will be evaluated qualitatively.	Sensory disturbance to wildlife
Change in wildlife mortality risk	The Project may result in the direct mortality of wildlife through various mechanisms (e.g., collision mortality, vegetation clearing, and vehicle traffic). Direct mortality risk will be assessed in a semi-quantitative approach	Direct change to wildlife mortality risk
	Indirect mortality risk, due to changes by the Project to other potential sources of mortality risk to wildlife (e.g., increasing predation risk), may also occur. This effect pathway will be evaluated in a qualitative manner.	Indirect change to wildlife mortality risk

9.1.4 Boundaries

9.1.4.1 Spatial Boundaries

Spatial boundaries for wildlife and wildlife habitat have been determined based on the potential for Project activities to have effects on wildlife and wildlife habitat within these defined areas. Spatial boundaries are summarized in **Table 9-2** and **Figure 9-1**.

Table 9-2: Spatial Boundaries for the Wildlife and Wildlife Habitat Assessment

Spatial Boundary	Description
Project Development Area (PDA)	Includes the Project footprint, which is the anticipated maximum area of physical disturbance associated with the construction and operation phases of the Project. The PDA includes the temporary (i.e., during construction) and permanent areas of physical disturbance.

Spatial Boundary	Description
Local Assessment Area (LAA)	The LAA includes the PDA and an additional 1 km buffer beyond the PDA. This area accounts for the maximum activity restriction setback distance for wildlife SOMC (i.e., ferruginous hawk [*Buteo regalis*]), as determined by the *Saskatchewan Activity Restriction Guidelines for Sensitive Species* (ENV 2017).
Regional Assessment Area (RAA)	Includes the LAA and the PDA and an additional 10 km buffer allowing for a regional and landscape context of wildlife.

9.1.4.2 Temporal Boundaries

The temporal boundaries considered for the assessment of wildlife and wildlife habitat are based on the duration of each phase of the Project, as described below in **Table 9-3**.

Table 9-3: Temporal Boundaries for the Wildlife and Wildlife Habitat Assessment

Project Phase	Description
Construc on	The anticipated duration of the construction phase is approximately 1.5 years, which includes site preparation, construction of the Project components (e.g., WTGs, access roads, collector lines, substation, operation and maintenance building), reclamation of temporary workspaces, and Project commissioning.
Opera ons and Maintenance	The operation and maintenance phase will commence once the Project is commissioned, and is anticipated to continue for a minimum of 25 years before potential refurbishment or decommissioning may be required.
Decommissioning	The decommissioning phase is anticipated to last approximately six months, which will include the removal of above-ground infrastructure, portions of the concrete foundations, access roads and WTG pads, abandonment of buried collector lines, and reclamation of lands (including soils) within the PDA to a condition similar to pre-development conditions, and appropriate for the future land use objectives, based on consultation with the landowners and regulatory requirements at that time.

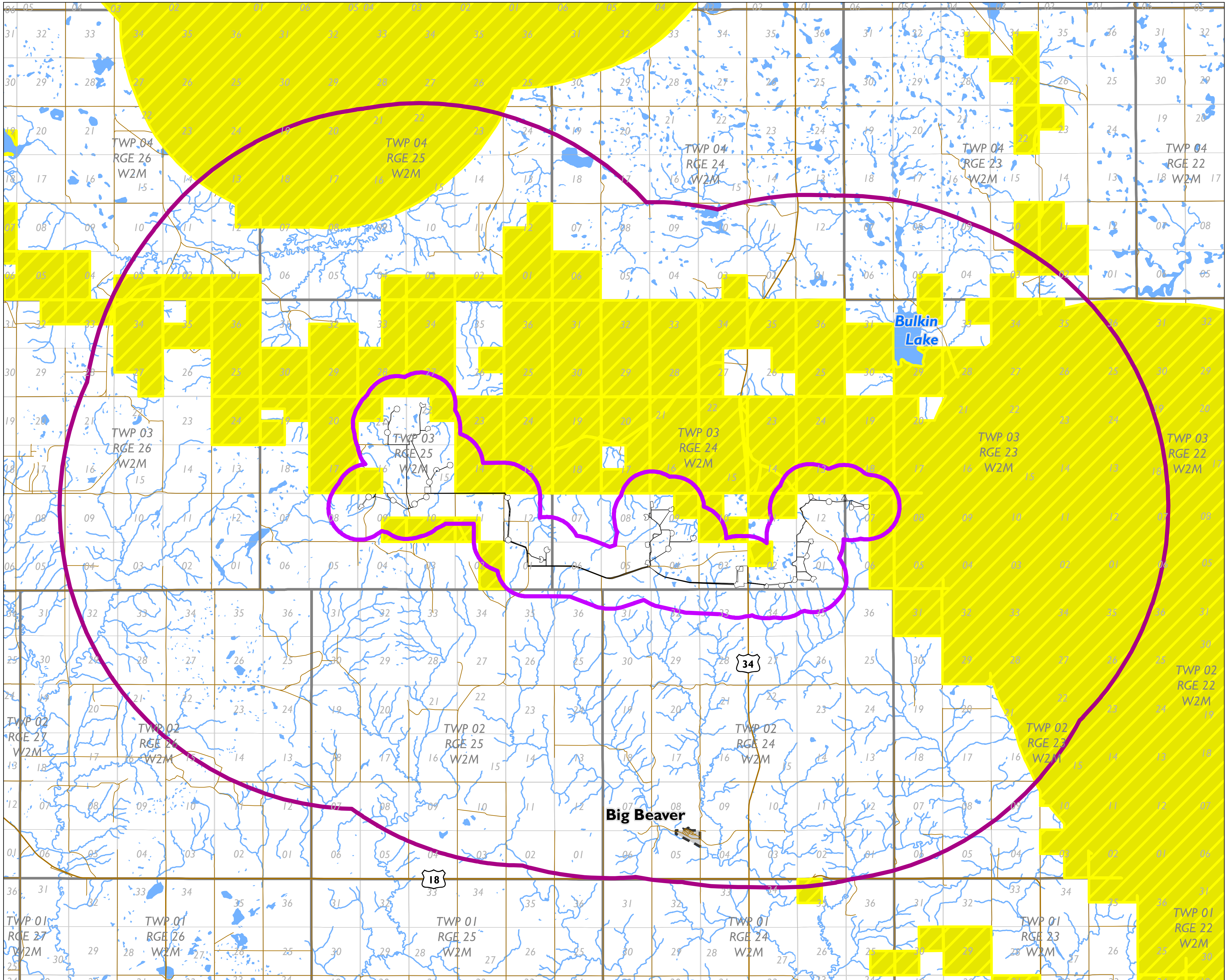


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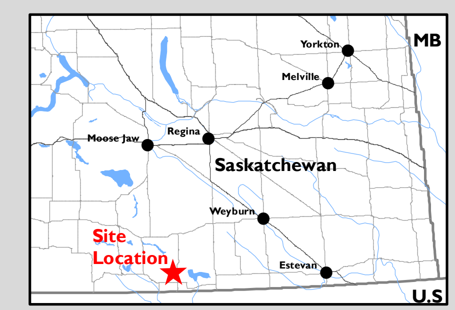
FIGURE 9-1
WILDLIFE AND WILDLIFE HABITAT ASSESSMENT AREAS

- Project Development Area
- Wildlife and Wildlife Habitat Local Assessment Area
- Wildlife and Wildlife Habitat Regional Assessment Area
- Wind Turbine Avoidance Zones
- Minor Roads
- Major Roads
- Hamlet
- Township
- Section
- Watercourse
- Waterbody



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MAP DRAWING INFORMATION:
DATA PROVIDED BY CANVEC, ESRI, GEOSASK & DILLON CONSULTING

MAP CREATED BY PH
MAP CHECKED BY CD

MAP PROJECTION: NAD 1983 UTM Zone 13N ROTATION: -0.25°

DILLON CONSULTING

PROJECT: 191825
STATUS: FINAL
DATE: 2021-03-01

FILE LOCATION: G:\GIS\2019\191825 - Outlaw Trail Energy Project\Product\Client\EIS\Figure 9_1 Wildlife and Wildlife Habitat Assessment Areas.mxd

9.1.5 Residual Effects Characterization

Characterization of residual effects on wildlife and wildlife habitat is evaluated based on characterizations detailed in **Table 9-4** below.

Table 9-4: Characterization of Residual Effects Evaluation Criteria for Wildlife and Wildlife Habitat

Characterization	Description	Quantitative Measures or Definition of Qualitative Categories
Direction	The long-term trend of the residual effect on wildlife and wildlife habitat	**Positive:** effect that moves parameters in a direction beneficial to wildlife and wildlife habitat relative to baseline conditions. **Adverse:** effects that moves parameters in a direction detrimental to wildlife and wildlife habitat relative to baseline conditions. **Neutral:** no change in parameters for wildlife and wildlife habitat in relation to baseline conditions.
Magnitude	The degree of change in measurable parameters of wildlife and wildlife habitat in comparison to existing conditions	**Negligible:** no measurable change in wildlife and/or wildlife habitat parameters. **Low:** Project activities are unlikely to have an effect on wildlife abundance in the LAA; temporary local shifts in distribution may occur in the area within the PDA and directly adjacent to it. **Moderate:** Project activities have an effect on wildlife abundance and distribution in the LAA; unlikely to have an effect on the abundance of wildlife in the RAA. **High:** confirmed effects on the wildlife abundance in the RAA.
Geographic Extent	The geographic area in which residual effects may occur on wildlife and wildlife habitat	**PDA:** effects occur only in the PDA. **LAA:** effects occur in the PDA and the LAA. **RAA:** effects occur in the PDA, LAA and RAA.
Duration	The period of time required until the measurable parameters of wildlife and wildlife habitat return to existing conditions, or the effect can no longer be measured	**Short-term:** effects occur only during the activity **Medium-term:** effects extend from construction and up to 10 years into maintenance and operation; effects extend throughout maintenance and operation. **Long-term:** effects extend through all phases of the Project and closure. **Permanent:** effects extend after closure of the Project and are unlikely to recover.
Frequency	When the effect occurs, how often during the life of the Project and in which phase(s) of the Project	**Single event:** event occurs once. **Multiple irregular events:** event occurs sporadically and/or intermittently. **Multiple regular events:** event occurs repeatedly and/or regularly. **Continuous:** event occurs continuously.
Reversibility	Weather a measureable parameter can return to existing condition at the end of the Project	**Reversible:** effect expected to return to baseline conditions with activity completion and reclamation. **Irreversible:** effect unlikely to return to baseline conditions.

9.1.6 Significance Definition

The significance threshold for effects on wildlife and wildlife habitat are those adverse effects that result in changes to the long-term persistence of wildlife SOMC species within the RAA or that are inconsistent with federal and provincial management objectives of those SOMC. Significance of effects are evaluated for the residual effects remaining on wildlife and wildlife habitat after mitigation measures have been implemented.

9.2 Existing Conditions for Wildlife and Wildlife Habitat

The following section details existing conditions of wildlife and wildlife habitat in the Project area (including the LAA and areas surveyed outside the LAA). The Project area is composed of native grassland, tame pastures, hay land, cultivated agriculture and wetlands. These land covers have the highest potential to provide wildlife habitat to wildlife SOMC. Wildlife and wildlife habitat assessments and field survey methods and results are detailed below along with the identification of potential pathways, mitigation strategies and residual effects.

9.2.1 Methods

9.2.1.1 Desktop Review

Existing information from provincial and federal databases, satellite imagery and literature sources were reviewed to determine known occurrences of SOMC, as well as life history requirements, and habitat availability in the LAA and RAA.

Wildlife SOMC are defined as federally and provincially legislated species at risk and species identified in federal and provincial tracking lists and activity restriction guidelines, including species:

- Listed under Schedule 1 of the federal *Species at Risk Act* as endangered, threatened or special concern (Government of Canada 2002);
- Listed in *The Wildlife Act* of Saskatchewan as endangered, threatened or vulnerable (Government of Saskatchewan 1998);
- Listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as endangered, threatened or special concern (Government of Canada 2020b) but not yet listed under SARA;
- Assigned a ranking of S1 or S2 (or a combination of these rankings) by the SKCDC (SKCDC 2019a); and
- Included in the *Saskatchewan Activity Restriction Guidelines for Sensitive Species* (ENV 2017).

See **Table I.1 in Appendix I** for federal and provincial ranking definitions.

The following data sources were reviewed:

- SKCDC wildlife database searched to the extent of the LAA (historical wildlife SOMC observations and sensitive wildlife habitat features; Government of Saskatchewan 2020);
- COSEWIC status reports (Government of Canada 2020b);
- Species at Risk Public Registry recovery strategies and action plans (Government of Canada 2020b);
- Birds of North America Online database (Cornell Lab of Ornithology and the American Ornithologists' Union 2020);
- Important Bird Areas (IBA) in Canada Online Database (BSC and Nature Canada 2020);
- Land cover data from the AAFC (AAFC 2019) databases;
- Satellite imagery such as ESRI World Imagery (ESRI 2020) and Google Earth Pro (2020); and
- Publicly available GIS spatial layers of protected lands. The Saskatchewan Representative Area Network spatial layer includes protected private and public lands (e.g., Ducks Unlimited project areas, conservation easements, provincial parkland, national parks, provincial community pastures, WHPA lands, and migratory bird sanctuaries) (HABISask 2020).

9.2.1.2 Wildlife Habitat Availability

Desktop review of data sources provided information about potential and historical SOMC occurrences, sensitive features (e.g., nests), and habitat types present within the LAA (i.e., land cover classes). Historical records, species ranges, life history requirements, and land cover available in the RAA were used to compile a list of potential SOMC that may interact with the Project (**see Table I.2 in Appendix I**). Wildlife habitat availability was evaluated based on the land cover classes described in **Table 8-5** (see **Section 8.2.1**). Because land cover classes represent broad habitat types (i.e., at a coarse scale), a habitat association approach was used to estimate habitat availability. Specifically, each land cover class was evaluated to determine whether or not it provided suitable habitat using knowledge of seasonal habitat requirements for each SOMC (see **Table I.3 in Appendix I**).

Prior to commencing wildlife surveys in 2015, land cover information from AAFC (2015) was incorporated into a GIS database and was used to identify the types of wildlife surveys required (i.e., target SOMC) and their target locations (i.e., areas with suitable habitat).

9.2.1.3 Field Surveys

Wildlife field surveys were conducted in 2015, 2016, 2017, and 2019 to support refining the Project area and layout (see **Table 9-5**). Wildlife surveys for raptor stick nest and bat activity were initially conducted in 2015. Surveys in 2016 focused on revised target quarter sections and included sharp-tailed grouse lek, bird movement, breeding bird, burrowing owl, common nighthawk/short-eared owl, and yellow rail surveys. In 2017, the additional signed target quarter sections were surveyed for sharp-tailed grouse leks, breeding birds, burrowing owls, ground verified for raptor nests and amphibians. In 2019, additional surveys for sharp-tailed grouse leks, burrowing owls, and raptor nests were completed to confirm previous sightings and verify additional lands. The field data reported in this section reflects observations made within the LAA after the Project layout was finalized. As a result, some wildlife survey sites are no longer sited within the LAA and data collected at those locations are not included in the results or residual effects assessment (**Table 9-16**). Bird and bat movement surveys are an exception and all data collected is presented as the surveys are used to determine movement patterns across the landscape. The Project is sited to avoid protected wildlife features (e.g., ferruginous hawk [*Buteo regalis*] nest) that were recorded during the wildlife surveys. Survey locations are illustrated in the Biophysical Map Set in **Appendix G**. All wildlife species observed during the 2015, 2016, 2017 and 2019 field surveys are listed in **Table I.4 in Appendix I**.

Wildlife surveys followed the Saskatchewan Government species detection survey protocols (ENV 2014b, 2014c, 2014d, 2014e, 2015a, 2015b), Alberta survey protocols identified by ENV (Alberta Environment and Sustainable Resource Development [Alberta ESRD] 2013a) or internal Stantec Standard Operating Procedures (SOP) where the ENV protocols were not available (e.g., bird movement surveys). Internal Stantec protocols were reviewed and approved by ENV prior to surveys being conducted. All required ENV scientific research permits were obtained prior to conducting wildlife surveys (permits #16FW110, #17FW069, and 19SD064) and data reported to the ENV in accordance with permit conditions.

Table 9-5: Wildlife Surveys Conducted During the 2015, 2016, and 2017 Field Seasons

Field Survey	Total Number of Survey Locations in 2015[1]	Total Number of Survey Locations in 2016[1]	Total Number of Survey Locations in 2017[1]	Total Number of Survey Locations in 2019	Number of Survey Locations in LAA[2]
Raptor[3]	helicopter	--	ground	ground	--
Bat Activity[4]	7	7	0	0	7
Bird Movement[5]	0	8	0	0	6
Breeding Bird	0	24	26	0	39
Burrowing Owl	0	24	26	15	39
Common Nighthawk and Short-eared Owl	0	17	0	0	16
Sharp-tailed Grouse Lek	0	24	17	14	36
Amphibian	0	0	8	0	7
Yellow Rail	0	5	0	0	5

NOTE:

[1] Survey locations within initial target lands (See **Section 2.3**)

[2] Survey location within LAA after PDA finalized

[3] All quarter sections within the LAA surveyed by helicopter in 2015, all quarter sections surveyed by ground in 2017

[4] Four of the seven survey locations represent MET towers, each with two detectors. A total of 11 detectors were set up within the LAA

[5] Surveys targeted bird movement across the landscape; as such, all survey locations were included even if they are outside of LAA.

Raptor Nest Surveys

To identify the location of active stick nests suitable for raptors within the Project area, the LAA was surveyed using an aerial survey method in 2015. On April 30 and May 1, 2015, one biologist qualified to identify raptor nests and identify raptors from a helicopter conducted the survey using a transect method. Transects were flown at approximately 80 km/h and at an elevation of 100 m along section lines in an east-west direction and suitable nesting structures were identified for further investigation. Areas of forested land cover were systematically surveyed at a slower velocity (i.e., approximately 30 km/h) to improve detection of stick nests. When target features (i.e., stick nests) were observed, the helicopter approached gradually until the nest was confirmed as either active or inactive. For active nests, the species was identified and confirmed by both biologists. Nest locations were plotted manually on hard copy maps, and a GPS location recorded using a hand-held GPS unit to verify accuracy of hand-plotted locations.

A ground-based raptor nest survey was conducted in spring 2017 as well as spring 2019 following ENV's recommended protocol (Alberta ESRD 2013a). Surveys were conducted prior to tree leaf-out throughout the LAA to identify any new stick nests and to confirm the continued occupancy of stick nests found in 2015 and 2017.

Bat Activity Surveys

To estimate the rate of bat activity within the Project area nocturnal acoustic bat activity surveys were completed. Bat activity surveys were conducted following the ENV approved survey protocol outlined in Lausen *et al*. (2010) and Alberta ESRD (2013b). Based on the application of these protocols at the time of the surveys, one spring (May 1 to June 7, 2016) and two fall monitoring periods (July 14 to September 30, 2015, and July 28 to September 14, 2016) were surveyed, with the specific length of each monitoring period being based on regulatory guidance and professional judgement (Lausen *et al*. 2010) and Alberta ESRD (2013b).

Alberta's *Bat Mitigation Framework for Wind Power Development* (the "Alberta Framework"; ESRD 2013b) establishes guidelines for interpreting pre-construction acoustic bat monitoring data for potential mitigation. This is based on Baerwald and Barclay (2009) who reported a weak statistically significant relationship between migratory bat activity rates at 30 m above ground and corrected fatality rates observed at wind farms in southern Alberta with turbines greater than 65 m height after reducing their sample size from the nine original projects studied down to five projects. More recent studies (Hein *et al*. 2013, Solick *et al*. 2020) based on a meta-analysis of larger datasets have discredited this approach and found no statistical relationship between pre-construction bat activity survey results and post-construction fatality rates. As such, while the Alberta Framework thresholds are referenced in this assessment, they should not be used to determine the mortality risk of the Project. Moreover, the *Adaptive Management Guidelines for Saskatchewan Wind Energy Projects* (ENV 2018) provides a robust framework to mitigate mortality rates of bats that exceed acceptable levels, given the uncertainty in mortality rates from any wind energy project in Saskatchewan.

A total of 11 AnaBat SD1 CF bat detectors were installed at 7 sites within the Project area. Eight detectors were placed at the four MET tower locations: one low (2 m height) and one high (>30 m height) at each tower. Additionally, low (ground) detectors (2 m height) were placed at three locations to provide comprehensive coverage of the Project area. High detectors were installed to provide information on bat activity within the turbine rotor-swept altitude, as low detectors only reliably collect data on bats travelling from ground level up to approximately 30 m in height (Titley Scientific 2020). All detectors were installed at the same locations during the three monitoring periods (see **Appendix I.5** for additional details).

Detectors were serviced on a bi-weekly basis to verify that equipment was functioning properly and to service the detector units and battery power systems. Call data were analyzed manually using AnalookW and summarized by species or species group in relation to environmental variables, monitoring dates, and detector height (see **Appendix I.5** for additional details). Due to the inability to identify all bat passes to species due to call quality and overlapping call parameters between species, the following five groupings were used for species classification when individual species classification was not possible:

- **Low frequency bat**: includes big brown bat (*Eptesicus fuscus*), silver-haired bat (*Lasionycteris noctivagans*), and hoary bat (*Lasiurus cinereus*)
- **High frequency bat**: includes eastern red bat (*Lasiurus borealis*), long-eared bat (*Myotis evotis*), little brown myotis (*Myotis lucifugus*), and western small-footed bat (*Myotis ciliolabrum*)
- **Big brown bat or silver-haired bat**
- **Eastern red bat or little brown myotis**
- **Myotis species**: includes long-eared bat, little brown myotis, and western small-footed bat

<u>Bird Movement Surveys</u>

Bird movement surveys were conducted to document species, flight path (i.e., height and direction) and habitat use during peak migration in the spring and fall. Surveys were conducted according a protocol that was reviewed and approved by ENV.

Surveys were conducted at eight sites in the spring and fall of 2016 (See **Figure 9-2**). Six sites (Sites 1-5 and 8) were located throughout the LAA to determine local movement patterns and two control sites (Sites 6 and 7) were located outside the Project area to provide a comparison of bird movement rates. The control sites were chosen to be along the Big Muddy Valley as this valley is potentially a flight corridor and, as such, could have higher bird activity than within the LAA. Having control sites allowed for a relative comparison of bird movement rates to better understand bird activity patterns within the LAA (e.g., are the movement rates within the LAA lower or higher than control sites which are expected to have higher bird activity).

Bird movement surveys consist of a 30-minute observation period. For all birds observed within a 1 km radius of the survey point center, the species, number of individuals, flight path and behavioural data (e.g., flapping, perched, soaring) were recorded. Observations made beyond the 1 km radius were recorded as incidental observations. Surveys were conducted when visibility was at least 800 m with a ceiling of 500 m or greater (e.g., precipitation no greater than a light rain, no fog). Wind speed can impede bird activity and surveys were generally discontinued if the wind was consistently above 30 km/h, except if it was a tail wind which can increase bird activity.

A total of three spring bird movement survey visits were conducted between April 21 and May 29, 2016 at each site. Each visit included two surveys consisting of one morning survey (between sunrise and 1100) and one afternoon survey (between 1100 and 1800).

A total of three fall bird movement survey visits were conducted between August 31 and October 1, 2016 at each site. Each visit included five surveys and targeted various bird guilds (i.e., waterbirds, landbirds, raptors). Waterbirds were surveyed twice each visit, once in the early morning a half hour before sunrise to one hour after sunrise and once in the evening one hour before sunset to a half hour after sunset. Landbirds were surveyed twice each visit, once in the morning between sunrise and 1100 and once in the evening between 1800 and sunset. Raptors were surveyed once each visit in the middle of the day between 1100 and 1800.

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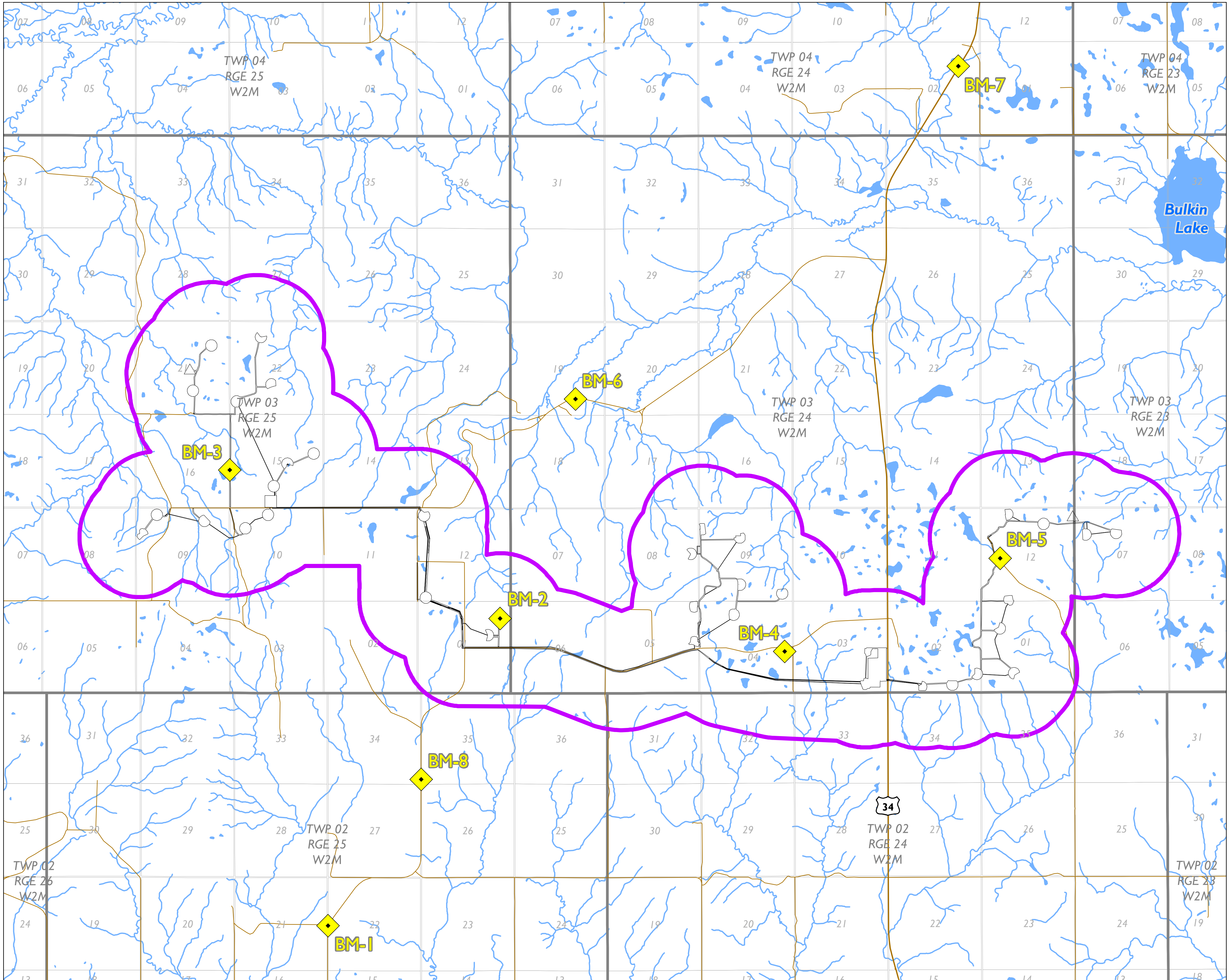
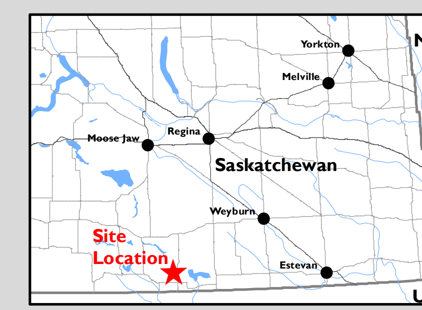
FIGURE 9-2
BIRD MOVEMENT SURVEY LOCATIONS



- Bird Movement Survey Site
- Project Development Area
- Wildlife and Wildlife Habitat Local Assessment Area
- Minor Roads
- Major Roads
- Hamlet
- Township
- Section
- Watercourse
- Waterbody



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MAP DRAWING INFORMATION:

DATA PROVIDED BY CANVEC, ESRI, GEOSASK, STANTEC & DILLON CONSULTING

MAP CREATED BY PH
MAP CHECKED BY CD

MAP PROJECTION: NAD 1983 UTM Zone 13N ROTATION: -0.25°

DILLON CONSULTING

PROJECT: 191825
STATUS: FINAL
DATE: 2021-03-01

FILE LOCATION: G:\GIS\2019\191825 - Outlaw Trail Energy Project\Product\Client\EIS\Figure 9_2 Bird Movement Survey Locations.mxd

Breeding Bird Surveys

Breeding bird surveys were conducted to document the presence of bird species, particularly SOMC, and their associated habitat. Surveys targeted representative habitat within the Project area including native grassland, pasture/forage, and cropland so that occupancy rates could be assessed across the LAA based on habitat type.

Three survey visits were conducted at a total of 39 sites between May 24 and June 25, 2016 and May 31 and June 28, 2017 (see **Appendix G** for survey locations). In 2016, 23 sites were surveyed and, in 2017, 16 new sites were surveyed to gather data in locations that were not surveyed in 2016 due to revisions to the Project layout (See **Section 2.3** for more information). Surveys were conducted under appropriate environmental conditions as outlined by the ENV (2014b) with modified temperature (air temperature above 0°C) and wind speed (winds not greater than 20 km/h) thresholds due to common environmental conditions during the spring in southern Saskatchewan (i.e., wind above 12 km/h and temperatures below 7°C). Each site was surveyed for a 10-minute observation period.

The dominant land cover (i.e., greater than 75% of the total habitat) for each site, within a 100 m radius of the point count center, was recorded. Potential land cover classes included cultivated (i.e., cropland), perennial (i.e., periodically seeded with perennial non-native grasses, such as tame pasture/forages), and native grassland. Of the 39 sites, 23 were mixed cultivated and perennial (e.g., 50% cultivated and 50% native grassland), 12 native grassland, 3 mixed perennial (e.g., 60% native grassland and 40% hayland), and 1 cultivated.

Burrowing Owl Surveys

Burrowing owl (*Athene cunicularia*) surveys were conducted in conjunction with the breeding bird surveys to detect the presence of burrowing owls and active burrows.

Three survey visits were conducted at a total of 31 sites between May 24 and June 25, 2016 and May 31 and June 28, 2017 (see **Appendix G** for survey locations), concurrently with breeding bird surveys. Separated burrowing owl surveys were completed again between May 27 and June 18, 2019, to evaluate lands within the revised layout LAA. In 2016, 15 sites were surveyed and, in 2017, 16 new sites were surveyed to gather data in locations that were not surveyed in 2016 due to revisions to the Project layout (See **Section 2.3** for more information), and again in 2019 an additional 15 sites were surveyed in additional lands of the revised layout. Surveys were conducted under appropriate environmental conditions as outlined by the ENV (2014c) with modified temperature (air temperature above 0°C) and cloud cover (any percent cloud cover) thresholds due to common environmental conditions during the spring in southern Saskatchewan (i.e., temperatures below 22°C and high cloud cover).

Common Nighthawk and Short-eared Owl Surveys

Common nighthawk (*Chordeiles minor*) and short-eared owl (*Asio flammeus*) surveys were conducted concurrently. Surveys targeted areas of suitable habitat within a 500 m buffer of the Project area which represents the maximum activity restriction setback for short-eared owls (ENV 2017), the largest setback of the two species.

Three survey visits were conducted at 16 sites (see **Appendix G** for survey locations) between May 26 and June 27, 2016, following the ENV's survey protocols (ENV 2015a, 2015b).

Sharp-tailed Grouse Lek Surveys

Sharp-tailed grouse (*Tympanuchus phasianellus*) lek surveys were conducted to detect the presence of leks (i.e., traditional dancing grounds used by sharp-tailed grouse during mating). Surveys targeted areas of suitable habitat (i.e., native grassland and tame pasture) and historically known lek sites (if applicable) within a 400 m buffer of the Project area which represents the maximum activity restriction setback for sharp-tailed grouse leks (ENV 2017).

Two survey visits were conducted at a total of 45 sites (see **Appendix G** for survey locations) between April 19 and May 2, 2016 (22 sites), April 18 and May 3, 2017 (9 sites), and May 7 and May 14, 2019 (14 sites) following Alberta's survey protocol (Alberta ESRD 2013a), adopted by the ENV. Sites in 2017 and 2019 were completed to account for revisions to the target lands of the Project and revisions to the layout.

Amphibian Surveys

Auditory amphibian surveys were conducted to detect potential breeding ponds for northern leopard frogs (*Lithobates pipiens*) and Canadian toads (*Anaxyrus hemiophrys*) within a 500 m buffer of the Project area which represents the maximum activity restriction setback for northern leopard frogs (ENV 2017).

Four survey visits were conducted at seven sites between April 29 and June 8, 2017, following the ENV's survey protocol (ENV 2014d) (see **Appendix G** for survey locations).

Yellow Rail Surveys

Yellow rail (*Coturnicops noveboracensis*) surveys targeted suitable breeding habitat (i.e., marshes) and were conducted within a 350 m buffer of the Project area which represents the maximum activity restriction setback (ENV 2017) for breeding yellow rails.

Three survey visits were conducted at five sites between May 27 and June 26, 2016, following the ENV's survey protocol (ENV 2014e) (see **Appendix G** for survey locations).

9.2.2 Results

9.2.2.1 Desktop Assessment

A search of the SKCDC HABISask database in March, 2018 was completed to identify historical occurrences of wildlife SOMC that have been previously documented within the LAA (Government of Saskatchewan 2017). An more recent search of the HABISask database in September, 2020, identified additional records of wildlife SOMC within the LAA (Government of Saskatchewan 2020); however, these records corresponded to the observations that were documented during the baseline field surveys for this Project (see **Section 9.2.2.2**) and reported to ENV, as per the Species Detection Research Permit requirements. As such, those additional records are provided as results of the field survey program for the Project. In addition to historical occurrences of wildlife, designated lands (e.g., conservation easements, WHPA lands) in the PDA and LAA were also identified in this desktop search.

Records observed in the PDA and LAA that were the result of specific field surveys completed as part of this field program were excluded as they are presented below in their respective results sections. Observations of SOMC recorded outside of this field program include a total of six wildlife observations and 54 quarter sections of designated WHPA lands found outside the PDA, but within the Wildlife LAA (**Table 9-6**).

Table 9-6: Historical Observations of Wildlife SOMC and Designated Lands in the PDA and LAA

Common Name	Scientific Name	No. of observations in the PDA	No. of observations in the LAA[1]
Amphibians and Reptiles			
Bullsnake	*Pituophis catenifer sayi*	0	1
Smooth greensnake	*Opheodrys vernalis*	2	0
Eastern yellow-bellied racer	*Coluber constrictor flaviventris*	1	1
Birds			
Sprague's pipit	*Anthus spragueii*	1	0
Designated Lands			
WHPA Lands (quarter sections)		0	54

[1] – Does not include observations within the PDA.

9.2.2.2 Wildlife Habitat Occurrence

The Mixed Grassland Ecoregion is characterized by a semi-arid climate and dominated by open grasslands with trees occurring in sparse locations with higher soil moisture (Acton *et al*. 1998). The area has approximately 50% cultivation, though this has likely increased since the time of that assessment.

As described in **Section 8.2.2**, land cover occurring within the Vegetation and Wetlands VEC was classified using the AAFC 2016 dataset. This dataset was field verified in 2016 and reconfirmed in 2019.

Under current conditions, 94.8% of the PDA is sited on previously disturbed lands (e.g., cropland, seeded pasture and forages, developed areas), while at the LAA level, these previously disturbed land cover types account for only 40.3% (**Table 9-7 and Figure 9-3**). Of these previously disturbed lands, 15.3% of the PDA is comprised of pasture/forages (i.e., a combination of hayland and perennial croplands, such as alfalfa), which does provide suitable habitat for some wildlife SOMC. Natural lands account for 5.2% of the PDA, including 4.5% grassland (8.3 ha) and the remaining 0.7% in broadleaf, wetlands, shrublands, and natural drainages.

The permanent footprint of the Project is reduced from 182.5 ha (PDA) during construction to 25.1 ha of permanent footprint during operation. Under the permanent footprint, the area of grasslands lost to disturbance accounts for 0.7 ha of land or 2.9% of the footprint, while the remaining 7.6 ha of grassland in the PDA would be allowed to return to grassland naturally or reseeded to grassland.

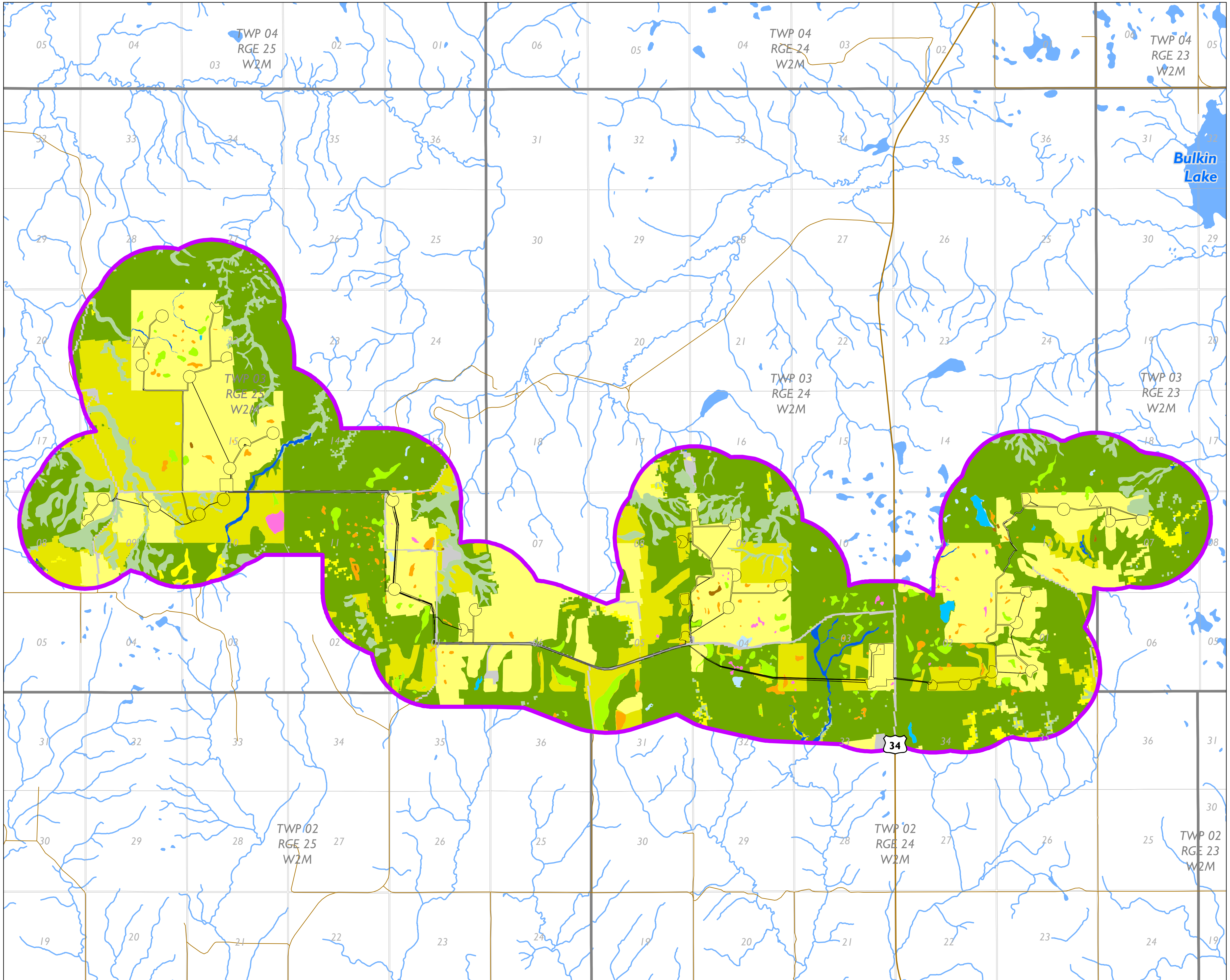
Table 9-7: Land Cover Types in the Wildlife and Wildlife Habitat PDA, LAA, and in the area of the Project Permanent Footprint

Land Cover Class	Project Footprint[1]		PDA (Project Footprint and Temporary Workspaces)[1]		LAA[1]		RAA[2]	
	Area (ha)	Proportion (%)	Area (ha)	Proportion (%)	Area (ha)	Proportion (%)	Area (ha)	Proportion (%)
Broadleaf	0.0	0.0%	0.3	0.2%	476.3	6.9%	1,608.7	2.2%
Cropland	16.8	67.2%	131.2	71.9%	1,758.7	25.4%	23,079.0	30.9%
Developed	5.1	20.4%	14.1	7.7%	122.4	1.8%	864.3	1.2%
Drainage	0.0	0.0%	0.1	0.0%	28.7	0.4%	-	-
Dugout	0.0	0.0%	0.0	0.0%	3.6	0.1%	-	-
Grassland	0.7	2.9%	8.3	4.5%	3,359.4	48.5%	37,271.1	49.8%
Pasture/Forage	2.3	9.3%	27.9	15.3%	905.8	13.1%	7,754.0	10.4%
Shrubland	0.0	0.0%	0.1	0.0%	71.6	1.0%	392.3	0.5%
Water[2]	0.0	0.0%	0.0	0.0%	8.4	0.1%	506.8	0.7%
Wetlands	<0.1	0.2%	0.7	0.4%	186.7	2.7%	852.2	1.1%
Barren/Exposed Land	0.0	0.0%	0.0	0.0%	0.0	0.0%	2,466.1	3.3%
Total[3]	**25.1**	**100.0%**	**182.5**	**100.0%**	**6,921.4**	**100.0%**	**74,794.5**	**100.0%**

[1] Land cover metrics are based on the desktop mapping.

[2] Data is based on AAFC 2019; does not identify drainage and dugout independent of water or wetlands.

[3] Area totals may not add up due to rounding of numbers.



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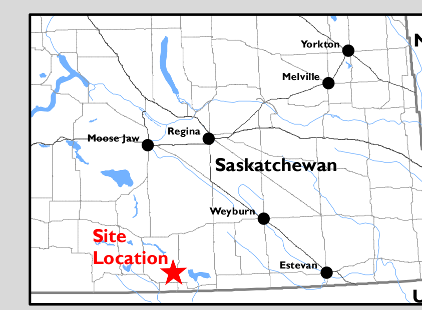
BluEarth RENEWABLES
FHQ

FIGURE 9-3
LAND COVER CLASSES IN THE WILDLIFE AND WILDLIFE HABITAT LOCAL ASSESSMENT AREA

Project Development Area
Wildlife and Wildlife Habitat Local Assessment Area

Land Cover
Class 1 - Ephermeral Wetland
Class 2 - Temporary Wetland
Class 3 - Seasonal Wetland
Class 4 - Semi-Permanent Wetland
Class 5 - Permanent Wetland
Drainage
Dugout
Agricultural
Broadleaf
Exposed Land / Barren
Native Grassland
Pasture / Forages
Shrubland
Urban / Developed
Water

Minor Roads
Major Roads
Hamlet
Township
Section
Watercourse
Waterbody



1:60,000
0 0.5 1 2 Kilometers

MAP DRAWING INFORMATION:
DATA PROVIDED BY AAFC, CANVEC, ESRI, GEOSASK, STANTEC & DILLON CONSULTING

MAP CREATED BY PH
MAP CHECKED BY CD

MAP PROJECTION: NAD 1983 UTM Zone 13N ROTATION: -0.25°

DILLON CONSULTING

PROJECT: 191825
STATUS: FINAL
DATE: 2021-03-01

FILE LOCATION: G:\GIS\2019\191825 - Outlaw Trail Energy Project\Product\Client\EIS\Figure 9_3 Land Cover Classes in the Wildlife and Wildlife Habitat Local Assessment Area.mxd

9.2.2.3 Field Survey Results

Raptor Nest Surveys

Fourteen stick nests suitable for nesting raptors were detected during aerial surveys in 2015 within the LAA. Of these, nine were occupied and five were unoccupied. Occupied nests consisted of:

- 5 red-tailed hawk (*Buteo jamaicensis*) nests;
- 2 great-horned owl (*Bubo virginianus*) nests;
- 1 Swainson's hawk (*Buteo swainsoni*) nest; and
- 1 ferruginous hawk nest

Ground-based raptor surveys were conducted in 2017 and again in 2019 to account for changes in the Project layout and concomitantly a change in the LAA to determine if any new stick nests were present. One new Swainson's hawk nests was observed in 2019 and the ferruginous hawk nest found in 2015 was confirmed as still active in 2017 (see **Appendix G**). The location of the ferruginous hawk nest (NW-32-02-24-W2M) does not overlap the PDA. The 1 km setback around the ferruginous hawk nest overlaps the PDA but only at the location of underground collector lines; the nearest point of the underground collector lines is at 730 m. Construction activities within this setback will occur outside of the activity restriction period (March 15 to July 15) and be confined to the construction workspace for those components.

Bat Activity Surveys

Bat activity survey results are presented in detail in the Pre-Construction Bat Monitoring Report (see **Appendix I.5**) with a summary presented below. Survey locations are presented in **Appendix G**.

During the spring monitoring period (April 29 to June 6, 2016), an average of 1.3 total and 0.3 migratory bat passes per detector night were recorded. Over the Alberta Framework (ESRD 2013b) fall monitoring period (August 1 – September 10), on average, 2.0 migratory bat passes per detector night were recorded at high detectors in 2015 and 2.4 migratory bat passes per detector night were recorded at high detectors in 2016 (**Table 9-8**). Myotis species and the big brown/silver-haired bat grouping were the most common species/species grouping of bats observed during all three monitoring periods.

Topography and landscape vegetation characteristics are likely to be the main contributing factors to detected bat activity rates as higher bat activity rates were recorded at detectors located closer to the Big Muddy Valley. The forested coulees of the Big Muddy Valley may provide suitable roosting and foraging habitat for bats and the valley itself may serve as a potential migration corridor.

Table 9-8: Summary of Bat Activity Rates in the Project Area

Acoustic Bat Activity Surveys	Fall 2015[1]	Spring 2016[1]	Fall 2016[1]
Total Bat Passes Per Detector Night (Aug 1 to Sep 10) (all detectors)	8.5	N/A[2]	7.1

Acoustic Bat Activity Surveys	Fall 2015[1]	Spring 2016[1]	Fall 2016[1]
Migratory Bat Passes Per Detector Night (Aug 1 to Sep 10) (all detectors)	3.3	N/A	2.9
Migratory Bat Passes Per Detector Night (Aug 1 to Sep 10) (high detectors only)[3]	2.0	N/A	2.4
Total Bat Passes Per Detector Night (full monitoring period) (all detectors)	6.1	1.3	7.5
Migratory Bat Passes Per Detector Night (full monitoring period) (all detectors)	2.4	0.3	3.0
Migratory Bat Passes Per Detector Night (full monitoring period) (high detectors only)	1.6	0.2	2.4

NOTES:

[1] Values represent average bat pass per detector night for all detectors, based on total bat passes per night divided by the number of nights the detectors were functional.

[2] N/A – Not applicable to spring monitoring period as these rows present data for the Alberta fall monitoring period of August 1 to September 10 only.

[3] Survey results from high detectors for the fall monitoring period of August 1 to September 10 are those compared to the Alberta Framework's bat activity threshold categories outlined in ESRD 2013b.

Bird Movement Surveys

Within the LAA (Sites 1-5 and 8), a total of 650 individuals from 41 species of birds were recorded during the spring bird movement surveys (**Table 9-9**) and a total of 2,240 individuals from 31 species of birds were recorded during the fall bird movement surveys (**Table 9-10**).

Within the LAA, Sites 3 and 5 had the most observations during spring (171 [26.3%] and 262 [40.3%] individuals, respectively) and fall (909 [40.6%] and 528 [23.6%] individuals, respectively) bird movement surveys (**Table 9-9** and **Table 9-10**). The high number of birds at these sites was due to a large flock of horned larks (*Eremophila alpestris*) in the spring and large flocks of American crows (*Corvus brachyrhynchos*) in the fall. The majority of observations made during bird movement surveys were landbirds with 483 individuals (74.3%) in the spring (**Table 9-9**) and 1,842 individuals (82.2%) in the fall (**Table 9-10**). The second most abundant guild was waterfowl (89 individuals [13.7%] in the spring and 317 individuals [14.2%] in the fall), followed by raptors (50 individuals [7.7%] in the spring and 64 individuals [2.9%] in the fall) (**Table 9-9** and **Table 9-10**).

During spring, the most abundant species observed in the LAA were horned lark, American crow, and red-winged blackbird (*Agelaius phoeniceus*) (250, 60, and 46 individuals, respectively); four SOMCs were detected including long-billed curlew (*Numenius americanus*), ferruginous hawk, barn swallow (*Hirundo rustica*), and Sprague's pipit (*Anthus spragueii*) (**Table 9-9**). During fall, the most abundant species in the LAA were American crow, Canada goose (*Branta canadensis*), and western meadowlark (*Sturnella neglecta*) (543, 153, and 122 individuals, respectively); four SOMCs were detected including ferruginous hawk, common nighthawk, barn swallow, and lark bunting (*Calamospiza melanocorys*) (**Table 9-10**).
At the control sites (Sites 6 and 7), a total of 265 individuals from 28 species were recorded during the spring bird movement surveys (**Table 9-9**) and a total of 202 individuals from 15 species were recorded

during the fall bird movement surveys (**Table 9-10**). Site 7 had the most observations during both spring and fall (194 and 113 individuals, respectively). In the spring, the majority of observations made during bird movement surveys were waterbirds in the spring (132 individuals, 49.8%), followed by landbirds (85 individuals, 32.1%) (**Table 9-9** and **Table 9-10**). In the fall, the majority of observations were landbirds (140 individuals, 69.3%), followed by waterfowl (34 individuals, 16.8%) (**Table 9-9** and **Table 9-10**). During spring, the most abundant species at the control sites was Franklin's gull (*Leucophaeus pipixcan*); two SOMC were detected including ferruginous hawk and barn swallow (**Table 9-9**). During fall, the most abundant species were rock dove (*Columba livia*) and western meadowlark (**Table 9-10**).

Table 9-9: Observation Summary of Spring 2016 Bird Movement Surveys within the Project Area

Common Name[1]	Scientific Name	No. of Individuals Observed							
		Site 1	Site 2	Site 3	Site 4	Site 5	Site 6[2]	Site 7[2]	Site 8
WATERFOWL GUILD[3]									
Tundra swan	*Cygnus columbianus*	0	0	0	0	7	0	0	0
Canada goose	*Branta canadensis*	0	0	4	2	0	0	7	0
Northern shoveler	*Spatual clypeata*	0	0	0	4	0	0	0	0
Gadwall	*Mareca strepera*	0	0	0	3	0	0	0	0
American wigeon	*Mareca americana*	0	0	0	3	0	0	0	0
Mallard	*Anas platyrhynchos*	0	0	3	21	3	3	11	0
Northern pintail	*Anas acuta*	0	0	1	8	0	0	0	0
Green-winged teal	*Anas crecca*	0	0	0	2	0	0	0	0
Duck spp.	*n/a*	0	0	21	5	2	0	0	0
WATERFOWL TOTAL		0	0	29	48	12	3	18	0
WATERBIRD GUILD[4]									
Double-crested cormorant	*Phalacrocorax auritus*	0	0	0	0	2	0	0	0
Franklin's gull	*Leucophaeus pipixcan*	0	0	0	1	0	0	130	0
Ring-billed gull	*Larus delawarensis*	0	0	0	1	0	0	0	0
California gull	*Larus californicus*	0	0	0	1	0	0	0	0
Tern spp.	*n/a*	0	0	0	4	0	0	2	0
WATERBIRD TOTAL		0	0	0	7	2	0	132	0
SHOREBIRD GUILD[5]									
Killdeer	*Charadrius vociferus*	0	0	2	1	0	0	0	0
Long-billed curlew	*Numenius americanus*	1	0	11	0	0	0	0	0
Marbled godwit	*Limosa fedoa*	0	0	0	2	0	0	0	0
Wilson's snipe	*Gallinago delicata*	0	0	0	0	0	0	2	0
Wilson's phalarope	*Phalaropus tricolor*	0	0	0	2	0	0	0	0
SHOREBIRD TOTAL		1	0	13	5	0	0	2	0

Common Name[1]	Scientific Name	No. of Individuals Observed							
		Site 1	Site 2	Site 3	Site 4	Site 5	Site 6[2]	Site 7[2]	Site 8
RAPTOR GUILD									
Turkey vulture	*Cathartes aura*	0	1	0	0	1	2	0	0
Northern harrier	*Circus hudsonius*	3	1	0	2	3	3	0	9
Swainson's hawk	*Buteo swainsoni*	1	0	4	3	2	3	4	2
Red-tailed hawk	*Buteo jamaicensis*	0	2	2	0	0	1	0	0
Ferruginous hawk	*Buteo regalis*	0	0	0	1	3	0	1	0
Hawk spp.	*n/a*	3	0	2	0	1	1	3	1
Golden eagle	*Aquila chrysaetos*	0	0	0	0	0	1	0	0
American kestrel	*Falco sparverius*	0	0	0	0	0	4	1	0
Merlin	*Falco columbarius*	0	0	0	1	0	0	0	0
Prairie falcon	*Falco mexicanus*	0	0	0	0	0	1	0	0
Raptor spp.	*n/a*	0	0	0	0	2	0	0	0
RAPTOR TOTAL		**7**	**4**	**8**	**7**	**12**	**16**	**9**	**12**
LANDBIRD GUILD[6]									
Sharp-tailed grouse	*Tympanuchus phasianellus*	1	0	0	0	1	0	0	0
Ring-necked pheasant	*Phasianus colchicus*	0	0	0	0	2	0	0	0
Mourning dove	*Zenaida macroura*	1	0	0	0	0	0	0	0
Rock pigeon	*Columba livia*	0	0	0	0	0	14	0	0
Black-billed magpie	*Pica hudsonia*	0	1	0	0	0	1	0	0
American crow	*Corvus brachyrhynchos*	0	2	57	1	0	6	0	0
Common raven	*Corvus corax*	0	1	2	0	0	1	0	1
Horned lark	*Eremophila alpestris*	3	17	9	12	205	0	7	4
Barn swallow	*Hirundo rustica*	1	0	0	1	0	0	2	2
American robin	*Turdus migratorius*	0	0	0	0	1	0	0	0
European starling	*Sturnus vulgaris*	0	0	2	0	0	5	0	0
Sprague's pipit	*Anthus spragueii*	1	2	0	0	2	0	0	0
Vesper sparrow	*Pooecetes gramineus*	3	1	0	0	1	0	1	0
Savannah sparrow	*Passerculus sandwichensis*	1	0	0	0	0	0	1	0
Western meadowlark	*Sturnella neglecta*	3	2	2	3	3	6	7	2
Red-winged blackbird	*Agelaius phoeniceus*	0	0	29	9	8	0	1	0
Brewer's blackbird	*Euphagus cyanocephalus*	0	8	3	2	1	3	6	0
Brown-headed cowbird	*Molothrus ater*	5	3	0	0	5	0	0	0
Blackbird spp.	*n/a*	2	2	6	4	5	7	3	1
Common grackle	*Quiscalus quiscula*	0	0	3	4	0	7	0	3

Common Name[1]	Scientific Name	No. of Individuals Observed							
		Site 1	Site 2	Site 3	Site 4	Site 5	Site 6[2]	Site 7[2]	Site 8
Songbird spp.	*n/a*	2	2	8	1	2	2	5	12
LANDBIRD TOTAL		**23**	**41**	**121**	**37**	**236**	**52**	**33**	**25**
Total		**31**	**45**	**171**	**104**	**262**	**71**	**194**	**37**

NOTES:

[1] Bold names indicate an SOMC.

[2] Control sites which are outside of the Project area.

[3] Waterfowl guild includes ducks, geese and swans.

[4] Waterbird guild includes grebes, loons, gulls, terns, herons, and pelicans.

[5] Shorebird guild includes wading species such as curlews, plovers, and sandpipers.

[6] Landbird guild includes passerines, corvids, and gamebirds.

Table 9-10: Observation Summary of Fall 2016 Bird Movement Surveys for the Project Area

Common Name[1]	Scientific Name	No. of Individuals Observed							
		Site 1	Site 2	Site 3	Site 4	Site 5	Site 6[2]	Site 7[2]	Site 8
WATERFOWL GUILD[3]									
Canada goose	*Branta canadensis*	36	0	3	0	0	3	28	114
Goose spp.	*n/a*	0	0	0	0	0	0	0	140
Blue-winged teal	*Spatula discors*	0	0	5	0	0	0	0	0
Mallard	*Anas platyrhynchos*	0	0	0	1	0	0	0	0
Duck spp.	*n/a*	0	0	6	12	0	3	0	0
WATERFOWL TOTAL		**36**	**0**	**14**	**13**	**0**	**6**	**28**	**254**
WATERBIRD GUILD[4]									
Great blue heron	*Ardea herodias*	0	0	0	0	0	0	2	0
Franklin's gull	*Leucophaeus pipixcan*	0	0	0	0	16	0	0	0
Gull spp.	*n/a*	0	0	0	0	1	0	0	0
WATERBIRD TOTAL		**0**	**0**	**0**	**0**	**17**	**0**	**2**	**0**
RAPTOR GUILD									
Turkey vulture	*Cathartes aura*	0	0	0	0	0	0	1	0
Northern harrier	*Circus hudsonius*	4	0	5	6	4	0	6	2
Sharp-shinned hawk	*Accipiter striatus*	0	1	0	0	0	0	0	0
Cooper's hawk	*Accipiter cooperii*	0	0	2	0	0	1	0	0
Swainson's hawk	*Buteo swainsoni*	8	0	1	2	1	2	0	2
Red-tailed hawk	*Buteo jamaicensis*	2	2	0	0	0	0	2	4
Ferruginous hawk	***Buteo regalis***	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**4**
Hawk spp.	*n/a*	3	0	0	1	3	3	1	0
Golden eagle	*Aquila chrysaetos*	0	0	0	0	0	0	1	0

Common Name[1]	Scientific Name	No. of Individuals Observed							
		Site 1	Site 2	Site 3	Site 4	Site 5	Site 6[2]	Site 7[2]	Site 8
American kestrel	*Falco sparverius*	0	1	0	0	0	0	0	0
Merlin	*Falco columbarius*	1	0	1	0	0	0	0	1
Raptor spp.	*n/a*	0	1	1	0	0	4	3	1
RAPTOR TOTAL		**18**	**5**	**10**	**9**	**8**	**12**	**14**	**14**
LANDBIRD GUILD[5]									
Sharp-tailed grouse	*Tympanuchus phasianellus*	0	6	0	5	19	0	8	2
Ring-necked pheasant	*Phasianus colchicus*	0	0	0	0	1	0	0	0
Mourning dove	*Zenaida macroura*	1	0	1	0	34	0	0	8
Rock pigeon	*Columba livia*	0	0	0	0	0	58	0	2
Common nighthawk	***Chordeiles minor***	**0**	**0**	**5**	**0**	**1**	**0**	**0**	**0**
Northern flicker	*Colaptes auratus*	0	1	0	0	0	0	0	0
Black-billed magpie	*Pica hudsonia*	0	0	6	9	3	0	0	0
American crow	*Corvus brachyrhynchos*	0	6	380	0	156	0	2	1
Horned lark	*Eremophila alpestris*	0	6	61	20	0	0	9	4
Barn swallow	***Hirundo rustica***	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Swallow spp.	*n/a*	0	12	0	0	0	0	0	2
House wren	*Troglodytes aedon*	0	1	0	0	0	0	0	0
American robin	*Turdus migratorius*	0	57	0	0	1	0	0	0
American goldfinch	*Spinus tristis*	0	0	0	0	2	0	0	0
Clay-colored sparrow	*Spizella pallida*	0	0	9	0	0	0	0	4
Vesper sparrow	*Pooecetes gramineus*	2	0	0	0	0	0	0	0
Lark bunting	***Calamospiza melanocorys***	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**
Savannah sparrow	*Passerculus sandwichensis*	0	0	60	1	0	0	0	0
Western meadowlark	*Sturnella neglecta*	74	0	1	40	3	13	32	4
Red-winged blackbird	*Agelaius phoeniceus*	1	0	15	0	8	0	0	3
Blackbird spp.	*n/a*	0	42	50	0	272	0	0	11
Songbird spp.	*n/a*	0	2	297	2	3	0	18	122
LANDBIRD TOTAL		**79**	**133**	**885**	**77**	**503**	**71**	**69**	**165**
Total		**133**	**138**	**909**	**99**	**528**	**89**	**113**	**433**

NOTES:
[1] Bold names indicate an SOMC.
[2] Control sites which are outside of the Project area.
[3] Waterfowl guild includes ducks, geese and swans.
[4] Waterbird guild includes grebes, loons, gulls, terns, herons, and pelicans.
[5] Landbird guild includes passerines, corvids, and gamebirds.

Breeding Bird Surveys

A total of 1,065 individuals and 46 species were recorded during the 2016 and 2017 surveys (**Table 9-11**). Eight SOMC were observed in the PDA and LAA including: long-billed curlew, common nighthawk, barn swallow, Sprague's pipit, chestnut-collared longspur (*Calcarius ornatus*), Baird's sparrow (*Ammodramus bairdii*), lark bunting, and bobolink (*Dolichonyx oryzivorus*) (see **Appendix G**).

Table 9-11: Observation Summary of 2016 and 2017 Breeding Bird Surveys in the Project Area

Common Name[1]	Scientific Name	No. of Individuals Observed per Land Cover[2]			
		Native Grassland	Cultivated	Mixed Perennial[3]	Mixed Cultivated and Perennial[4]
Blue-winged teal	*Spatula discors*	2	0	0	0
American wigeon	*Mareca americana*	4	0	0	0
Mallard	*Anas platyrhynchos*	4	0	0	2
Lesser scaup	*Aythya affinis*	1	0	0	0
Killdeer	*Charadrius vociferus*	1	1	0	9
Upland sandpiper	*Bartramia longicauda*	1	0	0	3
Long-billed curlew	***Numenius americanus***	**0**	**2**	**0**	**2**
Marbled godwit	*Limosa fedoa*	0	0	1	0
Wilson's snipe	*Gallinago delicata*	2	0	0	0
Willet	*Tringa semipalmata*	1	0	2	0
Ring-necked pheasant	*Phasianus colchicus*	0	0	0	2
Sharp-tailed grouse	*Tympanuchus phasianellus*	37	0	0	5
Mourning dove	*Zenaida macroura*	1	0	0	4
Common nighthawk	***Chordeiles minor***	**0**	**0**	**0**	**1**
Northern flicker	*Colaptes auratus*	0	0	1	1
Least flycatcher	*Empidonax minimus*	3	0	0	6
Eastern kingbird	*Tyrannus tyrannus*	4	0	0	19

Common Name[1]	Scientific Name	No. of Individuals Observed per Land Cover[2]			
		Native Grassland	Cultivated	Mixed Perennial[3]	Mixed Cultivated and Perennial[4]
Horned lark	*Eremophila alpestris*	6	6	0	73
Tree swallow	*Tachycineta bicolor*	3	0	0	1
Barn swallow	***Hirundo rustica***	**0**	**0**	**0**	**1**
House wren	*Troglodytes aedon*	1	0	0	0
American robin	*Turdus migratorius*	1	0	0	4
Gray catbird	*Dumetella carolinensis*	0	1	0	1
Brown thrasher	*Toxostoma rufum*	2	0	0	2
Sprague's pipit	***Anthus spragueii***	**34**	**0**	**4**	**11**
American goldfinch	*Spinus tristis*	4	0	1	9
Chestnut-collared longspur	***Calcarius ornatus***	**0**	**0**	**0**	**1**
Spotted towhee	*Pipilo maculatus*	2	0	0	0
Clay-colored sparrow	*Spizella pallida*	37	0	5	78
Vesper sparrow	*Pooecetes gramineus*	22	2	5	69
Lark bunting	***Calamospiza melanocorys***	**3**	**0**	**0**	**8**
Savannah sparrow	*Passerculus sandwichensis*	26	0	10	42
Grasshopper sparrow	*Ammodramus savannarum*	39	0	10	26
Baird's sparrow	***Ammodramus bairdii***	**42**	**0**	**10**	**32**
Le Conte's sparrow	*Ammodramus leconteii*	0	0	1	1
Song sparrow	*Melospiza melodia*	2	2	0	2
Bobolink	***Dolichonyx oryzivorus***	**9**	**0**	**12**	**8**
Western meadowlark	*Sturnella neglecta*	38	1	11	83
Brown-headed cowbird	*Molothrus ater*	9	0	2	27
Red-winged blackbird	*Agelaius phoeniceus*	11	1	0	18
Brewer's blackbird	*Euphagus cyanocephalus*	5	1	0	28

Common Name[1]	Scientific Name	No. of Individuals Observed per Land Cover[2]			
		Native Grassland	Cultivated	Mixed Perennial[3]	Mixed Cultivated and Perennial[4]
Ovenbird	*Seiurus aurocapilla*	0	0	0	1
Common yellowthroat	*Geothlypis trichas*	1	0	0	0
Black-and-white warbler	*Mniotilta varia*	0	0	0	1
Yellow warbler	*Setophaga petechia*	9	1	0	22
Chestnut-sided warbler	*Setophaga pensylvanica*	0	0	0	2
Total		**367**	**18**	**75**	**605**

NOTES:

[1] Bold names indicate an SOMC.

[2] To accurately document breeding birds in a grassland environment, the following BBS data was excluded from the final dataset: a) pelicans, cormorants, geese, gulls, terns, raptors, and corvids because these species have large territories or habitually feed far from their breeding territory; b) duplicate observations between the 1st and 2nd five-minute survey period to avoid double counting; c) unknown species; d) all fly-by observations; and e) observations located outside the 100 m observation radius; these observations are considered incidentals.

[3] Habitat was mixed perennial cover (i.e., native grassland, tame pasture, and/or hayland).

[4] Habitat was mixed perennial cover and cultivated (i.e., annual crop).

Burrowing Owl Surveys

No burrowing owls were detected during the 2016, 2017 or 2019 surveys.

Common Nighthawk and Short-eared Owl Surveys

A total of seven common nighthawks and one short-eared owl were detected during the 2016 surveys (see **Appendix G**).

Sharp-tailed Grouse Lek Surveys

Thirteen leks were observed within the LAA in all years; however, two leks observed in 2019 were in the same location as two leks observed in 2016. Therefore, eleven unique lek locations were observed in total (see **Appendix G**). None of the leks overlap the PDA; however, the 400 m setback for five of the eleven lek locations overlaps the PDA:

- The setback of one lek in NW-33-02-24-W2M overlaps an underground collector line route;
- The setback of one lek in SE-04-03-24-W2M overlaps an underground collector line route;
- The setback of one lek in SE-05-03-24-W2M overlaps an underground collector line route, underground feeder line route, overhead collector line route, access road, and a WTG location;
- The setback of one lek in SW-13-03-24-W2M overlaps an underground feeder line route, access road, and a WTG location; and

- The setback of one lek in SE-21-03-25-W2M overlaps the temporary workspace around a WTG location.

Note that some leks occurred within 400 m of regularly used municipal roads. Construction activities within the 400 m setback will occur outside of the activity restriction period (March 15 to May 15) and will be confined to the construction workspace.

Amphibian Surveys

A total of five breeding ponds for northern leopard frogs were detected during the 2017 surveys. The breeding ponds are not affected by the PDA; however, the 500 m setback around each breeding pond overlaps the following components of the PDA: WTGs pads, temporary workspaces, access roads, and underground and overhead collector lines. Construction activities at these locations will be confined to the construction workspace.

Yellow Rail Surveys

No yellow rails were detected during the 2016 surveys.

Incidental Wildlife SOMC Observations

A total of 11 wildlife SOMC were detected as incidental observations in the LAA during the 2016, 2017 and 2019 targeted wildlife, vegetation community, or wetland surveys (see **Table 9-12**).

Table 9-12: Incidental Wildlife Observations

Common Name	Scientific Name	No. of Individuals in the Wildlife and Wildlife Habitat LAA
Herptiles		
Northern leopard frog	*Lithobates pipiens*	3
Smooth Greensnake	*Opheodrys vernalis*	2
Birds		
Osprey	*Pandion haliaetus*	1
Ferruginous hawk	*Buteo regalis*	1
Red-necked phalarope	*Phalaropus lobatus*	1
Long-billed curlew	*Numenius americanus*	10
Common nighthawk	*Chordeiles minor*	5
Barn swallow	*Hirundo rustica*	3
Sprague's pipit	*Anthus spragueii*	52
Baird's sparrow	*Ammodramus bairdii*	13
Bobolink	*Dolichonyx oryzivorus*	31

9.3 Project Interactions with Wildlife and Wildlife Habitat

The Project may interact with wildlife and wildlife habitat through various physical activities, through each of the three Project phases. These interactions may result in the environmental effects identified in **Table 9-1**. A summary of the interactions between specific Project activities and the wildlife and wildlife habitat VEC, and the potential effects that may result from these interactions, are identified below in **Table 9-13**.

The Project has the potential to interact with wildlife and wildlife habitat through two effect pathways that include a change in wildlife habitat availability or suitability, and a change in wildlife mortality risk. The effect pathways for these two potential effects are described as follows.

Table 9-13: Summary of Project Interactions with Wildlife and Wildlife Habitat

Project Activities	Environmental Effects	
	Change in Habitat Availability	Change in Mortality Risk
Construction Phase		
Site preparation, including vegetation clearing, topsoil stripping, grading and development of WTG locations, MET tower locations, access roads, substation and temporary workspaces	✓	✓
Installation of WTG and MET tower foundations; erection of WTGs and MET towers	-	-
Installation of collector lines and substation infrastructure	✓	✓
Post-construction reclamation of temporary workspaces	✓	✓
Operation and Maintenance Phase		
Operation and use of WTGs, MET towers, substation and access roads	✓	✓
Routine and unplanned maintenance of WTGs	-	✓
Routine and unplanned maintenance of collector lines, substation infrastructure and access roads	-	✓
Decommissioning Phase		
Dismantling and removal or Project infrastructure, including WTGs, collector lines, substation infrastructure and access roads	✓	✓
Site reclamation	✓	✓

9.4 Assessment of Residual Environmental Effects on Wildlife and Wildlife Habitat

Residual effects are those effects predicted to occur on a VEC following the consideration of mitigation measures. The predicted residual effects of the Project are estimated based on the baseline conditions of the Project Area determined through desktop and field surveys, the reported effects of other wind energy projects on similar landscapes, and after accounting for the mitigation measures specific to the Project and jurisdiction. Residual effects are also those carried forward in an assessment of potential cumulative effects, considering other past, present and foreseeable future projects within the RAA.

9.4.1 Analytical Assessment Techniques

The assessment of potential environmental effects of the Project on wildlife and wildlife habitat was completed by calculating or estimating using qualitative methods the potential changes to the following measurable parameters that may be affected by the Project:

- Areal extent (ha) of loss or degradation of natural land cover types;
- Sensory disturbance to wildlife;
- Direct change to wildlife mortality risk; and
- Indirect change to wildlife mortality risk.

9.4.2 Change in Habitat Availability

9.4.2.1 Effect Pathways

A change in wildlife habitat availability can occur through direct and indirect habitat loss. Direct habitat loss can occur when there is a change in land cover that converts suitable wildlife habitat (e.g., grassland) into unsuitable wildlife habitat (e.g., roads). Indirect habitat loss can occur through sensory disturbances (e.g., noise and turbine movement) that cause wildlife to avoid areas that would otherwise be suitable wildlife habitat. The potential for the Project activities to cause a change in wildlife habitat are described below for each of the Project activities. The percent change of each land cover type within the wildlife and wildlife habitat LAA as a result of the area disturbed in the PDA and from the permanent Project footprint are presented in **Table 9-14**.

Table 9-14: Temporary (PDA) and Permanent (Footprint) Percent Change in LAA Land Cover Types

Land Cover Type	LAA Area (ha)	PDA Area (ha)	Permanent Footprint (ha)	% Change in LAA from PDA	% Change in LAA from Permanent Footprint
Grassland	3,351.1	8.3	0.7	-0.2%	-0.0%
Cropland	1,627.5	131.2	16.8	-8.1%	-1.0%
Broadleaf	476.0	0.3	0.0	-0.1%	-0.0%
Pasture/Forage	878.0	27.9	2.3	-3.2%	-0.3%

Land Cover Type	LAA Area (ha)	PDA Area (ha)	Permanent Footprint (ha)	% Change in LAA from PDA	% Change in LAA from Permanent Footprint
Wetlands	186.0	0.7	0.0	-0.4%	-0.0%
Roads	108.3	14.1	5.1	13.0%	4.7%
Shrubland	71.5	0.1	0.0	-0.1%	-0.0%
Drainage	28.6	0.1	0.0	-0.3%	-0.0%
Water	8.4	0.0	0.0	-0.0%	-0.0%
Dugout	3.6	0.0	0.0	-0.0%	-0.0%
Total	**6,738.9**	182.5	25.1	-	-

Construction

Construction activities, including site preparation (e.g., stripping of the sod and seedbank) for the WTGs, temporary workspaces, access roads, substations, and collector lines, will result in direct habitat loss.

Indirect habitat loss caused by sensory disturbances associated with construction activities such as increased vehicle traffic, heavy equipment operation, light and noise, may result in reduced habitat effectiveness and wildlife avoidance. These disturbances are temporary in nature. If construction activities occur during the spring and/or summer, the breeding and rearing success for some wildlife species may be affected (Bayne *et al*. 2008, Frances and Barber 2013, Habib *et al*. 2007). Responses are species-specific and vary but may include increased stress, loss of productivity, habitat avoidance, nest abandonment, and changes in local distribution. For example, nesting ferruginous hawks that are exposed to daily human disturbance have been observed flushing from their nest when human activities were at least within 200 m from the nest, while 33% of the disturbed nests were abandoned by the adults (White and Thurow 1985). Male sharp-tailed grouse have shown intolerance to human activities near lek sites by displacing an average of 400 m away from the lek (Baydack 1986).

Operation and Maintenance

Additional direct habitat loss during the operation and maintenance phase of the Project is not expected to occur. Vegetation regrowth will occur at temporary workspace locations that were disturbed during construction but habitat loss will persist within the LAA due to permanent Project infrastructure (e.g., WTGs, access roads).

Indirect habitat loss may continue to affect wildlife habitat suitability and availability during operation through sensory disturbance. Project facilities (e.g., WTGs) emit noise during operation and may result in avoidance behaviour in some wildlife. Wildlife behavioural changes associated with wind-energy facilities appear to be species- and site-specific. One study of nesting grassland birds found lower densities within 0 to 180 m of WTG with densities decreasing by more than 50% within 50 m of WTGs (Leddy *et al*. 1999). Another study observed displacement behaviour within 200 m of WTGs for grasshopper sparrows (*Ammodramus savannarum*) and clay-colored sparrows (*Spizella pallida*) but no changes in behaviour for western meadowlarks, chestnut-collared longspur (*Calcarius ornatus*), or killdeer (*Charadrius vociferus*) (Shaffer and Johnson 2008). A third study observed displacement behaviour in seven grassland songbird species with displacement ranging from 100 m to 300 m from WTGs (Shaffer and Buhl 2015). One study in the Prairie Pothole Region (PPR) found that the breeding densities of waterfowl in both agricultural and natural land cover was reduced by a median value of 21% within 804 m of WTGs (Loesch *et al*. 2013). Conversely, a different study in the PPR found no effect on shorebird or waterbirds using wetlands within 805 m of WTGs (Niemuth *et al*. 2013).

Disturbances associated with WTGs may also affect the quality of adjacent wetland habitat for wetland-dependent species (e.g., northern leopard frogs, yellow rails). Noise from operating WTGs may mask breeding calls for birds and amphibians and reduce overall reproductive success and increase site abandonment (Narins 1990, Habib *et al*. 2007).

<u>Decommissioning</u>

The effect pathways of the Project that could result in a change in wildlife habitat availability during the decommissioning phase are similar to those of the construction phase.

9.4.2.2 Mitigation for Change in Wildlife Habitat

In addition to the mitigation measures outlined in **Section 8.4.2.2** that are identified to reduce or avoid effects to vegetation and wetlands, the following mitigation measures are summarized to address changes in wildlife habitat resulting from the Project. A suite of mitigation measures identified to address Project effects on wildlife and wildlife habitat are provided in the EPP (see **Appendix C**).

<u>Construction</u>

The most important first step in mitigating effects on wildlife habitat is the avoidance of areas that provide suitable habitat, and particularly natural land cover, such as grasslands, during the planning phase of the Project. This has been accounted for through numerous revisions to the Project layout and sourcing of the largest available turbines to reduce the total number of turbine locations and footprint of the Project (see **Section 2.3**). The reduction in turbines from 50 turbines in the layout presented in the Project TPP down to 33 turbines constructed in this final layout will also reduce the overall area of habitat affected by sensory disturbance.

In addition to avoidance during the planning phase, Project-specific mitigation measures, along with standard industry practices, best management practices, and avoidance measures will be implemented during the construction, operation and maintenance, and decommissioning phases to reduce the potential effects on wildlife habitat.

Direct habitat loss will be reduced through mitigation measures employed during construction to reduce the loss of native land cover types, such as minimal temporary road widths (see **Section 8.4.3.2**). Indirect habitat loss due to sensory disturbances will be mitigated by timing construction outside of the bird nesting season (April 26 to August 15) (ECCC 2020a) and following any additional timing and setback restrictions as outlined in the ENV *Activity Restriction Guidelines for Sensitive Species* (ENV 2017) when possible.

If construction cannot avoid the nesting season, vegetation clearing activities will take place prior to the nesting season or pre-construction surveys (e.g., nesting bird surveys) will be completed by a qualified environmental monitor prior to the start of construction activities. If an active nest is found, OTW LP will consult with the ENV to identify appropriate mitigation measures including species-specific setback distances and activity timing restrictions as outlined by the ENV (2017).

Where mitigation for direct habitat loss this is not feasible, the option to offset residual effects will be explored to achieve no net loss of wildlife habitat overall (see **Appendix C**).

Operation and Maintenance

During the operation and maintenance phase, there will be no anticipated physical activities that would cause direct impacts to wildlife habitat as these would be completed during construction. Routine maintenance of the Project will take into consideration the optimal timing of activities for the turbines to reduce or avoid indirect effects on habitat availability, while also considering the mitigating effects on wildlife mortality risk.

Decommissioning

During decommissioning, direct habitat loss is only expected at temporary workspaces. Project infrastructure (e.g., WTGs, substation, access roads) will be decommissioned and removed allowing these previously disturbed areas to revegetate, thereby increasing the amount of wildlife habitat available.

Indirect habitat loss due to sensory disturbances is expected to be similar during decommissioning activities as those during construction and may result in temporary behavioural changes in wildlife. Wildlife may be displaced and/or temporarily abandon habitat due to the noise and light emitted by vehicles and heavy equipment during decommissioning.

9.4.2.3 Predicted Residual Effects

The predicted residual effects on wildlife habitat availability are those that are likely to occur based on the potential effects pathways, after considering avoidance or reductions of those effects pathways through the application of mitigation measures outlined above.

Construction

Direct habitat loss will include both permanent and temporary disturbances, though the duration will vary between these two types of disturbance. Permanent habitat loss will occur at the WTG pads, permanent access roads, overhead collector line, and the substation; these components are primarily located on cultivated lands which provide less suitable habitat for wildlife SOMC.

The permanent footprint of the Project will be 25.1 ha (13.7% of the PDA), which includes all land cover types (**Table 9-15**). This is a 62.1% reduction from the footprint of the layout proposed in the Project TPP (Stantec 2018). Of this 25.1 ha permanent footprint, the area of suitable wildlife habitat (i.e., tame pasture/forage and natural land cover types) will be 3.0 ha total (12%), with most (2.3 ha) of this being in tame pasture/forage. This total area accounts for 0.3% of the suitable wildlife habitat within the LAA.

Temporary workspaces, access roads (construction), underground collector lines, and turbine laydown areas are considered temporary disturbances as these areas will be reclaimed once construction is completed. Temporary construction areas amount to 157.5 ha, of which only 34.2 ha (21.7%) is considered suitable wildlife habitat, and again most of which (25.5 ha) is in tame pasture/forage land cover (**Table 9-15**). This area of temporary disturbance is almost half the area of temporary disturbance (307.6 ha) proposed in the previous layout presented in the Project TPP (Stantec 2018). This total area accounts for 3.8% of the suitable wildlife habitat within the LAA.

Native grassland provides suitable habitat for 35 wildlife SOMC including Sprague's pipit, chestnut-collared longspur, and smooth greensnake (see **Appendix I, Table I.2**). Approximately 8.3 ha of grassland will be affected during construction, which is a 61.5% reduction from the area of native grassland (21.6 ha) that would have been affected in the layout presented in the Project TPP (Stantec 2018). Most (91.4%) of the grassland disturbed will be temporary to install underground collector lines or temporary roads for construction, and will be returned to grassland following construction. At the LAA scale, the temporary disturbance to native grassland amounts to 0.2% of the grassland within the wildlife and wildlife habitat LAA; the permanent footprint disturbance to grassland amounts to <0.05% of the grassland within the LAA (**Table 9-14**).

Table 9-15: Footprint Area by Permanent Project Component and Temporary Construction Areas

Land Cover Type	Cropland	Pasture/Forage	Grassland	Developed	Wetlands	Broadleaf	Drainage	Shrub	Total
Permanent Footprint (ha)									
WTG Pad	2.4	0.7	0.0	0.0	0.0	0.0	0.0	0.0	3.0
Access Roads	10.3	1.5	0.5	2.8	0.0	0.0	0.0	0.0	15.2
Substation	3.9	0.0	0.0	0.1	0.0	0.0	0.0	0.0	4.0
Collector Lines (Overhead)	0.2	0.2	0.2	2.2	0.0	0.0	0.0	0.0	2.7
MET Towers	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal Permanent Footprint	**16.8**	**2.3**	**0.7**	**5.1**	**0.0**	**0.0**	**0.0**	**0.0**	**25.1**
Temporary Workspace Areas (ha)									
WTG Workspace	63.1	18.1	0.0	0.1	0.0	0.1	0.0	0.0	81.3
Collector Lines (Underground)	14.2	3.2	4.9	0.3	0.5	0.1	0.1	0.1	23.3
Access Roads	17.1	3.5	1.8	0.1	0.1	0.1	0.0	0.0	22.7
Collector Lines (Overhead)	0.5	0.8	0.9	8.5	0.1	0.0	0.0	0.0	10.8
MET Towers	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3
Laydown Area	16.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.2
Subtotal Temporary Workspace	**114.3**	**25.5**	**7.6**	**9.0**	**0.6**	**0.3**	**0.1**	**0.1**	**157.5**
Total	**131.2**	**27.9**	**8.3**	**14.1**	**0.7**	**0.3**	**0.1**	**0.1**	**182.5**

Tame pasture also provides suitable habitat for 31 wildlife SOMC including bobolink, burrowing owl, and American badger (**see Appendix I, Table I.2**). A further 27.9 ha (15.3 %) of tame pasture/forages will be disturbed during construction, though 91.7% of this area will also be returned to this land cover following construction completion (**Table 9-15**). At the scale of the LAA, the temporary disturbance and permanent footprint effects to tame pasture/forage amount to 3.2% and 0.3%, respectively, of the amount of this land cover within the wildlife and wildlife habitat LAA (**Table 9-14**).

The area of disturbance to wetlands and other natural land cover (i.e., shrubland, drainage, water, broadleaf) by the PDA amounts to 1.1 ha, which corresponds to 0.7% of those land covers within the wildlife and wildlife habitat LAA. At completion of construction, most of this area will be reclaimed and the permanent footprint will be <0.05 ha and accounts for <0.05% of the available land cover in these classes within the LAA.

Indirect habitat loss due to sensory disturbance will occur in the PDA during construction; however, this will be short-term and a temporary disturbance. Best management practices will reduce or avoid this disturbance during construction to the extent possible. Overall, the characterization of residual effects for changes in wildlife habitat availability during construction are presented in **Table 9-16**.

Table 9-16: Characterization of Residual Effects on Wildlife Habitat Availability during Project Construction

Criterion	Measure	Description
Direction	Adverse	A net loss of wildlife habitat during construction, though largely mitigated through avoidance and offsetting.
Magnitude	Low	The area of habitat lost has been reduced substantially from the previous layout and consists of approximately 20% of the temporary footprint.
Geographical Extent	PDA	Changes in habitat availability during construction will be largely limited to the PDA
Duration	Long Term	Construction activities will be short-term in any given area of the Project; however a small percent (13.7%) of the PDA will persist through operation and maintenance.
Frequency	Continuous	Construction activities will occur continuously during the construction phase of the Project.
Reversibility	Reversible	Changes to habitat availability are anticipated to be reversible.

Operation and Maintenance

No additional direct habitat loss is expected as a result of operation and maintenance activities. The permanent loss of habitat due to Project components such as WTG pads, access roads, and substations will persist during the operational phase.

Indirect habitat loss as a result of sensory disturbance from WTGs will continue throughout operation and maintenance. Based on the literature, the distance at which grassland songbirds experience an effect from sensory disturbance varies, but as a precautionary approach to estimate the effects of sensory disturbance a distance of 200 m was used. Assuming a lower density of birds within 200 m of WTGs, the Project may result in the reduction of habitat availability by 74.5 ha of grassland and 49.6 ha of tame pasture/hayland, which represents approximately 2.2% and 5.5%, respectively, of the available habitat in these land covers within the LAA. This is a substantial reduction from the 125.0 ha in native grassland and 149.9 ha in tame pasture/hayland estimated as indirect disturbance from the Project layout presented in the TPP. Note that the indirect disturbance will likely be less than the 74.5 ha and 49.6 ha reported because this represents the area within 200 m of the 37 turbine locations, and it will be reduced due to only 33 turbines being constructed.

Table 9-17: Characterization of Residual Effects on Wildlife Habitat Availability during Project Operation and Maintenance

Criterion	Measure	Description
Direction	Adverse	A likely decrease in suitability of habitat near turbines.
Magnitude	Negligible	The area of temporary construction will be reclaimed to its previous land cover and areas of permanent Project components will be offset.
Geographical Extent	PDA/LAA	Changes in habitat availability during construction will be largely limited to the PDA, but may extend into the LAA; offset habitat will likely occur outside the LAA
Duration	Long Term	Habitat loss and offsetting will occur for the duration of the Project.
Frequency	Continuous	Construction activities will occur during a single event.
Reversibility	Reversible	Changes to habitat availability are anticipated to be reversible.

Decommissioning

Change in wildlife habitat availability during the decommissioning phase will be minimal and temporary and the potential effects will be similar to the construction phase, thought at the conclusion of the decommissioning phase will be in a direction opposite the construction phase. The characterization of residual effects on wildlife habitat during decommissioning are presented in **Table 9-18**.

Table 9-18: Characterization of Residual Effects on Wildlife Habitat Availability during Project Decommissioning

Criterion	Measure	Description
Direction	Positive	While a small decrease in habitat availability during construction, the overall effect at the end of decommissioning will be a positive net gain in habitat availability relative to the Operation and Maintenance activities.
Magnitude	Low	The net area of increase in wildlife habitat at the conclusion of decommissioning will be low in magnitude.

Criterion	Measure	Description
Geographical Extent	PDA	Changes in habitat availability during decommissioning will be largely limited to the PDA, though a small increase in habitat availability outside the PDA due to cessation of turbine activity.
Duration	Permanent	The decommissioning of the Project will result in a permanent increase in habitat relative to the operation and maintenance phase.
Frequency	Continuous	Decommissioning activities will occur continuously during the construction phase of the Project.
Reversibility	Reversible	Changes to habitat availability are anticipated to be reversible; reclamation of the land could result in changes to habitat availability from other projects and activities on the landscape.

9.4.3 Change in Mortality Risk

A change in wildlife mortality risk can occur as a result of a wind energy project. Wildlife mortality rates can increase as a result of direct mortality from Project activities and components, as well as indirectly through increased predation risk or access to lands. The effect pathways, as well as their assessment for the Project are presented as follows for each Project phase.

9.4.3.1 Effect Pathways

Construction

Direct wildlife mortality could occur during construction due to vegetation clearing and vehicle collisions. Vegetation clearing can result in the destruction of bird nests, burrows, dens, and amphibian overwintering and breeding ponds. Ground nesting birds (e.g., Sprague's pipit, bobolink) are particularly vulnerable during construction activities and mortality may occur if the nest is damaged and/or destroyed (i.e., direct mortality) or abandoned by the adults (i.e., indirect mortality). Species with decreased mobility (e.g., young birds, small mammals, amphibians) are more susceptible to direct mortality as they may not be able to escape construction activities.

The potential for collisions due to increased equipment and vehicle traffic may result in increased wildlife mortality risk. Low-flying birds and bats may be exposed to increased mortality risk through interactions with construction equipment and vehicles during migration (Johnson *et al*. 2003, Machtans *et al*. 2013). Animals that undergo seasonal migrations and often cross roads when moving from breeding to overwintering habitat, such as amphibians, can be at greater risk of collision mortality.

Indirect mortality risk is associated with sensory disturbance on the landscape (e.g., noise) that can result in behavioural changes. Some species may move away (displacement) from the disturbance, increasing their predation risk as they leave cover. Displacement may also increase energy expenditure and reduce an individual's survival and reproductive success (Powlesland 2009), as well as decreased survivorship among the young of the year (see **Section 9.3.1**).

Operation and Maintenance

Direct mortality can occur during the operation and maintenance phase through collisions with Project infrastructure and vehicles. For terrestrial species like mammals and amphibians (e.g., American badger [*Taxidea taxus taxus*], northern leopard frog) changes in mortality risk are associated with maintenance vehicle traffic. The effect pathways are similar to those during the construction phase; however, the mortality risk from vehicle collisions would be lower during operations due to reduced vehicle traffic within the PDA following completion of construction.

The primary mechanism for direct wildlife mortality is collision of birds and bats with towers, nacelles, or revolving blades of WTGs. This effect pathway is described as follows in the context of birds and bats.

Birds

A review of 43 Canadian wind-energy facilities across a variety of landscapes found bird mortality rates that ranged from 0 to 26.9 birds/turbine/year (corrected for detection bias) with an average mortality of 8.2 ± 1.4 (95% CI) (Zimmerling *et al*. 2013). Within the review, five Saskatchewan wind-energy facilities averaged 10.1 birds/turbine/year and 26 Alberta facilities averaged 4.5 birds/turbine/year (Zimmerling *et al*. 2013). A review of mortality monitoring studies by Bird Studies Canada (BSC *et al*. 2018) found the average non-raptor bird mortality rate in Alberta to be 2.2 ± 0.40 birds/turbine/year. This may be a function of a greater number of older wind energy facilities in Alberta, which would have smaller turbines each with less rotor-swept area. As such, the comparison of collision rates per turbine may be biased compared to the majority of turbines in this study from Saskatchewan being larger turbines found at the Centennial Wind Energy Project.

Passerines represent the majority of bird fatalities at North American wind-energy projects (62.5%, Erickson *et al*. 2014; 70.0%, BSC *et al*. 2018). These numbers are roughly representative of the proportion of birds in North America which are passerines. Most passerine fatalities consist of nocturnal migratory songbirds (Kingsley and Whittam 2005, Erickson *et al*. 2014, American Wind Wildlife Institute 2020), in part because they are the most abundant species in the landscapes that host wind-energy facilities, but also because of their tendency to migrate at altitudes that may interact with the WTG rotor-swept area (National Academy of Sciences 2007). The mortality risk of wind-energy projects for grassland songbirds such as Sprague's pipit, loggerhead shrike, and chestnut collared longspur have not been directly studied. None of these species were reported in the Bird Studies Canada (BSC *et al*. 2018) species list. Of the mortality monitoring data available for projects operating within the breeding range of Sprague's pipits, none have reported finding any fatalities, despite the monitoring program at Judith Gap recording the presence of Sprague's pipit during breeding bird surveys (TRC Environmental Corporation 2008), and several of the turbines at the Centennial Wind Energy Facility being placed within grassland. However, species which have aerial courtship displays (e.g., horned lark, vesper sparrow, and bobolink) may be at a higher risk of collision if the display occurs within the rotor swept area (Kerlinger and Dowdell 2003). Indeed, horned larks represented 28.2% of all mortalities recorded in Alberta and vesper sparrows accounted for an additional 4.8% (BSC *et al*. 2018).

After passerines, the greatest number of bird fatalities at wind-energy facilities consist of raptors, waterbirds, and waterfowl, with shorebirds accounting for 1% of fatalities or less (Erickson *et al*. 2014, BSC *et al*. 2018). Several studies have documented avoidance of turbines by raptors, waterfowl, and shorebirds (Johnson *et al*. 2000, Whitfield 2010, Garvin *et al*. 2011, Sugimoto and Matsuda 2011). A higher rate of waterfowl fatalities has been recorded in Alberta compared to across Canada (13.5% vs. 2.7%, BSC *et al*. 2018); this increased rate was almost entirely due to mallards (*Anas platyrhyncos*) which accounted for 11.7% of fatalities (BSC *et al*. 2018), and was anecdotally accounted for by one wind energy project. This is also likely due to the fact that mallards are the most abundant duck species in North America and forage in fields, which may increase their potential interactions with turbines.

Topography and landscape features (e.g., ridges, steep slopes, valleys, shorelines) can concentrate bird movement during migration and lead to an increased level of interaction between turbines and birds (Kingsley and Whittam 2005). Generally, wind-energy facilities located within grassland landscapes have relatively lower bird and bat mortality rates than facilities located in landscapes with topographic features such as forested ridges and large rivers (Arnett *et al*. 2007, Arnett *et al*. 2008, Baerwald and Barclay 2009).

The Project is located south of the Big Muddy Valley, which is characterized by a ridge of forested coulees. Control sites for the bird movement surveys were sited along the valley in order to assess if this landscape feature could act as a corridor for migrating birds and therefore have higher number of birds than within the Project area. However, results from the bird movement surveys showed that bird movement rates at the control sites were similar to those within the Project area. Based on the data collected, it appears that the Big Muddy Valley does not concentrate bird movement during migration more so than the surrounding landscape. Furthermore, there are no other prominent features on the landscape near the Project area that could serve as a concentration site for birds (e.g., a large body of water), thereby lowering the potential for an increased level of interaction between the Project and birds.

The risk associated with indirect mortality will be similar to the construction phase and primarily related to disturbances from WTGs and maintenance activities. There may be the potential for increased predation as a result of the WTG and infrastructure (e.g., collector line poles) that may be used by perching raptors. However, indirect mortality may actually be reduced as a result of fewer predatory species in the LAA; Francis *et al*. (2009) reported that in areas with higher noise disturbance, predation rates of songbirds was reduced and nest success was higher because of reduced use of treatment areas by avian nest predators.

Bats

Bat mortality has been extensively studied at wind-energy facilities. The average bat mortality rate from wind-energy projects in Alberta is 6.3 ± 1.2 bats/turbine/year according to BSC *et al*. (2018). Zimmerling and Francis (2016) estimated bat mortality in Saskatchewan at 11.7 bats/turbine/year and Alberta at

10.9 bats/turbine/year. Across Canada, approximately 74.3% of bat fatalities are migratory bats (e.g., eastern red bat, hoary bat, silver haired bat) (BSC *et al*. 2018). In Alberta, 94.9% of bat mortalities are migratory species of which 43.5% are hoary bats and 50.5% are silver haired bats, with similar mortality rates by species groups in Saskatchewan (BSC *et al*. 2018). Due to the devastating effects of white nosed syndrome, there is increased concern about mortalities to susceptible resident bat populations which appear to have the less risk of mortality from collisions with wind-energy facilities than do migratory bat populations.

Environmental conditions can increase bat mortality risk. Nights with light wind (i.e., wind speed less than 6 m/s), when aerial insects are more active, have documented higher mortality rates (Arnett *et al*. 2008, Kunz *et al*. 2007). Horn *et al*. (2006) also indicated that blade rotational speed was a significant negative predictor of collisions with turbine blades, suggesting that bats may be at higher activity rate on nights with low wind speeds when turbines are typically not active, which would mitigate for mortality risk. The majority of bat fatalities across Canada are seasonal and occur between July and September with a peak in mid-August to early-September (BSC *et al*. 2018).

As noted above, a recent meta-study by Solick *et al*. (2020) confirmed previous meta-analysis results from Hein *et al*. (2013) that predicting the mortality risk to bats from wind energy projects using pre-construction survey data is not feasible, despite the weak relationship with small sample size reported in the Baerwald and Barclay (2009) study, which has been adopted by Alberta as their guidance thresholds. As such, predicting the potential change in mortality risk of bats as a result of the Project is not based on strong scientific findings.

Decommissioning

During decommissioning, the effect mechanisms associated with direct and indirect mortality risk to wildlife are similar to those during the construction phase. Direct mortality may occur through vehicle collisions and indirect mortality may occur through temporary sensory disturbances associated with heavy equipment and noise.

9.4.3.2 Mitigation for Change in Wildlife Mortality Risk

Several of the mitigation measures identified in **Section 9.4.2.2** will assist in reducing the potential for change in wildlife mortality risk associated with the Project. Additional specific mitigation measures addressing change in mortality risk during each of the Project phases are outlined below. A suite of mitigation measures identified to address Project effects on wildlife and wildlife habitat are provided in the EPP (see **Appendix C**).

Construction

Additionally, sensitive wildlife features (e.g., sharp-tailed grouse lek, ferruginous hawk nest) were identified during field surveys are avoided by the PDA and outside of the recommended activity restriction setback where possible. Where the PDA overlaps an activity restriction setback (e.g., collector lines installed along roads), potential effects to a feature will be mitigated through the implementation of seasonal timing restrictions for construction.

Change in wildlife mortality risk will also be mitigated by establishing vehicle speed limits on access roads to reduce the potential of vehicle collisions.

Operation and Maintenance

Mitigations to reduce or avoid wildlife mortality risk due to collisions with Project infrastructure during the operation and maintenance phase begins with Project siting during the planning phase. Sensitive habitat types that are associated with wildlife SOMCs, such as wetlands and native grassland, were further avoided where possible during revisions to siting of Project infrastructure (see **Section 2.3**). Revisions to the layout also resulted in fewer, larger turbines, which tends to reduce the overall mortality risk of the Project, as larger turbines tend to have lower relative (per MW) mortality rates compared to smaller turbines. The reduction from 50 turbines proposed in the Project TPP down to 33 turbines for this final layout, should reduce the overall risk.

Mitigation measures to be implemented during operation and maintenance will be determined through post construction mortality monitoring and will be determined in consultation with ENV following the *Adaptive Management Guidelines for Saskatchewan Wind Energy Projects* (ENV 2018). This adaptive management framework was developed to mitigate the uncertainty around wildlife mortality risk, because of the high uncertainty in predicting mortality rates at wind energy facilities, regardless of their location on the landscape. Through this framework, maximum acceptable levels of mortality mitigate the potential risk of higher mortality at any potential wind energy project through the requirements for management responses, should mortality rates exceed trigger thresholds. Moreover, there is also the potential for compensatory mitigation in the event of trigger threshold exceedance.

Decommissioning

Mitigation measures applied to reduce or avoid changes in mortality risk during the decommissioning phase of the Project are similar to those during construction. Additional mitigation measures that reflect best management practices at the time of decommissioning will be considered and applied, where appropriate.

9.4.3.3 Predicted Residual Effects

The predicted residual effects on wildlife mortality risk are those that are likely to occur based on the potential effects pathways, after considering avoidance or reductions of those effects pathways through the application of mitigation measures outlined above.

Construction

Overall, with the application of mitigation measures, the likelihood of an increase in wildlife mortality risk during construction is low and will not result in a measurable residual effect on wildlife populations within the LAA. The characterization of residual effects of the Project on wildlife mortality risk is presented in **Table 9-19**.

Table 9-19: Characterization of Residual Project Effects on Wildlife Mortality Risk during Construction

Criterion	Measure	Description
Direction	Adverse	Changes in wildlife mortality risk would be in a negative direction.
Magnitude	Negligible	Mortality risk from construction activities would not likely be measurable.
Geographical Extent	PDA	Changes in wildlife mortality risk will be limited to the PDA
Duration	Short-term	Changes in mortality risk due to construction would be limited to the construction phase.
Frequency	Multiple irregular events	Mortality Risk will occur through several repeated events from construction activities
Reversibility	Reversible	Changes in mortality risk during construction will be reversible following the completion of construction

Operation and Maintenance

During operation and maintenance, the mortality risk to terrestrial wildlife species (e.g., northern leopard frog, American badger) due to collisions with vehicles is less than during construction due to reduced vehicle traffic. Overall, the risk of collisions would be less than the existing risk posed by residential vehicles traveling on rural roads within the Project area since Project vehicles will be limited to 25 km/hr, and will likely represent a very small proportion of traffic in the area.

Potential residual effects during operation and maintenance is primarily related to bird and bat mortality. The Project is located outside of avoidance zones identified by ENV (2019) and WTGs were sited to avoid native grassland and sensitive wildlife features (e.g., ferruginous hawk nest, sharp-tailed grouse lek) observed in the LAA, where possible. Additionally, the Project is not located within, or between, sensitive environmental features (e.g., a river valley, between IBAs) that may cause an elevated mortality risk due to increased movement rates. The Project is primarily sited in cultivated lands (70.2%) which provides less suitable habitat for SOMC.
The majority of bird observations within the LAA were landbirds (74.3% spring, 82.2% fall), followed by waterfowl (13.7% spring, 14.2% fall) and raptors (7.7% spring and 2.9% fall). The bird movement rates observed within the LAA were similar to the bird movement rates found at the control sites outside of the LAA; however, Sites 3 and 5 consistently had higher bird movement rates compared to the other sites in the LAA and the control sites (see **Table 9-9** and **Table 9-10**). The higher abundance of birds at these sites was due to flocks of American crow and blackbird species at both sites during spring and fall, and a flock of horned lark at Site 5 in the spring (see **Table 9-9** and **Table 9-10**). There were no clear movement corridors through the LAA.

Bat activity rates were an average of 0.2 migratory bat passes per detector night during the 2016 spring monitoring period and 2.0 migratory bat passes per detector night in 2015 and 2.4 migratory bat passes per detector night in 2016 during the fall monitoring period (August 1 to September 10) at the elevated detectors. While these rates fall within the moderate rate of activity for bats, activity cannot accurately predict mortality rates for the Project.

Given the uncertainty in wildlife mortality rates, particularly birds and bats, at wind energy turbine facilities, application of the *Adaptive Management Guidelines for Saskatchewan Wind Energy Projects* (ENV 2018) will ensure that bird and bat mortality rates are consistent with rates acceptable within Saskatchewan.

The characterization of residual effects of the Project on wildlife mortality risk is presented in **Table 9-20**.

Table 9-20: Characterization of Residual Project Effects on Wildlife Mortality Risk during Operation and Maintenance

Criterion	Measure	Description
Direction	Adverse	Mortality rates will increase due to the Project
Magnitude	Low	The overall rate of mortality from the Project will be regulated through the *Adaptive Management Guidelines for Saskatchewan Wind Energy Projects* (ENV 2018).
Geographical Extent	RAA	Mortality will likely include some migratory species, and therefore effects will extend beyond the LAA.
Duration	Long-term	An increase in mortality rate is expected to last for the duration of the Operation and Maintenance Phase.
Frequency	Multiple Regular Events	Mortality will likely occur as regular events over the duration of the Operation and Maintenance Phase
Reversibility	Reversible	Changes in mortality risk will be reversible when the Project is decommissioned

Decommissioning

Change in wildlife mortality risk during the decommissioning phase will be minimal and temporary and the potential effects will be similar to the construction phase.

9.5 Assessment of Cumulative Environmental Effects on Wildlife and Wildlife Habitat

Of the Project residual effects on wildlife and wildlife habitat discussed in **Sections 9.5**, both potential effects are likely to act in a cumulative manner. These include:

- Change in wildlife habitat; and
- Change in wildlife mortality risk.

These residual effects are measurable for the Project and may act in a cumulative manner with the potential adverse residual effects of other past, present, or reasonably foreseeable or publicly known future projects or physical activities within the RAA. The potential residual effects from these other projects and activities that may interact with the Project-specific residual effects are predicted based on publicly available information, and information that was presented in the Project TPP. An assessment of these potential cumulative interactions is provided in this section, in which the cumulative effect pathways are identified, feasible mitigation measures to address cumulative effects are proposed and the resulting residual cumulative effects (where identified) are described and evaluated for significance.

9.5.1 Projects and Activities Included in the Cumulative Effects Assessment

Projects listed in **Table 4-3** have previously resulted or will result in a loss of native vegetation and a corresponding amount of wildlife habitat for SOMC that inhabit this land cover, particularly during construction. As well, future activities or projects will contribute to a change in wildlife mortality risk in the RAA due to the potential for direct mortality during construction and operation. For example, the Poplar River Coal Mine and SaskPower's Outlaw Trail Transmission Interconnection project for this Project present additional mortality risk to birds. These effects could overlap with the mortality risk for the Project (**Table 9-19**).

Table 9-21: Interactions with Potential to Contribute to Cumulative Effects on Wildlife and Wildlife Habitat within the RAA

Project or Activity in RAA with Potential to Interact Cumulatively with the Project	Project-Specific Residual Environmental Effects	
	Change in Wildlife Habitat	Change in Wildlife Mortality Risk
Past and Present Projects and Activities		
Agricultural Conversion	✓	✓
Residential Development	✓	✓
Recreational Activities	✓	✓
Oil and Gas Development	✓	✓
Road and Rail Development	✓	✓
Power Generation, Transmission and Distribution	✓	✓

Project or Activity in RAA with Potential to Interact Cumulatively with the Project	Project-Specific Residual Environmental Effects	
	Change in Wildlife Habitat	Change in Wildlife Mortality Risk
Poplar River Power Station	✓	✓
Resource Extraction Activities	✓	✓
Poplar River Coal Mine	✓	✓
Future Projects and Activities		
SaskPower Interconnection Transmission Line to the Project	✓	✓

Note: ✓ denotes a potential cumulative interaction; – denotes no anticipated cumulative interaction.

9.5.2 Change in Wildlife Habitat

9.5.2.1 Cumulative Effect Pathways

Land cover within the RAA is a mixture of natural and anthropogenic land cover types (**Table 9-7**). Approximately 48,385.1 ha (64.7%) in the RAA consists of land cover that provides suitable habitat to wildlife species, with the remainder consisting of developed lands, cropland, and barren/exposed soils.

Cumulative effects arising from past, present, and reasonably foreseeable future projects and activities that result in a change in habitat have similar effect pathways as effects arising from the Project. Project-related changes in wildlife habitat availability relate to the loss of native vegetation (specifically, native grassland, tame pasture, and wetlands) that could be used by wildlife species and sensory disturbance associated with construction or the use of vehicles on the landscape. Future projects also have the potential to result in a loss of native vegetation and wetlands affecting wildlife habitat availability in the RAA. The Poplar River Coal Mine Expansion will result in a total loss of 464 ha of native vegetation once the expansion is completed, of which 230 ha are designated as WHPA lands (ENV 2011). Although the location of SaskPower's Outlaw Trail Transmission Interconnection project is unknown, it is expected that it will have similar types of effects pathways related to changes in direct habitat loss as the Project's overhead collector lines. For these known projects, the loss of native vegetation and wetlands represent a small proportion of wildlife habitat available in the RAA. In the context of the RAA land cover, the Project footprint will affect less than 0.01% of the available wildlife habitat, combined with the area affected by the Poplar River Coal Mine, this will amount to 0.01% of the suitable wildlife habitat within the RAA.

During the operation and maintenance phase for the Project and future projects, no additional direct habitat loss will occur and the PDA will be reduced to 25.1 ha. Sensory disturbance is expected to occur during operations for the Project and has the potential to overlap with sensory disturbance during construction and operation of the Prairie River Coal Mine expansion. While sensory disturbance of the Project is anticipated to result in approximately 124.1 ha of suitable wildlife habitat, the area of indirect effects on wildlife habitat from other projects within the RAA is unknown. Noise associated with the mine extension, however, will not exceed current levels within the region as noise will be relocated from the current pits to the extension lands (AMEC 2008). The area of indirect effects on wildlife habitat from the Project (124.1 ha) combined with the area directly disturbed by the Poplar River Coal Mine (464 ha), will result in an area of wildlife habitat equal to 0.01% of the available wildlife habitat within the RAA.

9.5.2.2 Mitigation Measures for Cumulative Effects

Beyond Project-specific mitigation measures outlined in **Section 9.4.2.2**, there are limited additional collaborative mitigation measure options to reduce the cumulative effect of the Project and future projects on wildlife habitat availability. Future projects may consider offsetting effects on wildlife habitat that could assist to reduce the net adverse cumulative effects on wildlife habitat.

9.5.2.3 Residual Cumulative Effects

Though future project construction schedules are unknown, the future projects have the potential to interact cumulatively with Project residual effects; however, given the small percentage of the RAA affected, cumulative habitat loss is not expected to have population level effects on SOMC and wildlife in general in the RAA.

9.5.3 Change in Wildlife Mortality Risk

9.5.3.1 Cumulative Effect Pathways

The modified landscape of the RAA has already been and continues to be a source of mortality risk to wildlife due to, agricultural practices, vehicle traffic on roads, and collisions with existing transmission lines, among others. The construction phase of the Project and future projects will contribute to a change in mortality risk from through vehicle collisions and destruction of nests if activities occur during the nesting period. Construction activities primarily pose a risk to less mobile species, such as amphibians, and bird nests.

The operation and maintenance phase of the Project and future projects (particularly SaskPower's Outlaw Trail Transmission Interconnection project) have the potential for a change in mortality risk because of the potential for wildlife (particularly birds and bats) collisions with above ground structures (e.g., turbines, transmission lines). Wind energy projects are known to cause mortality of birds and bats, with passerines and migratory bats being the most susceptible. Transmission lines are also known to cause mortality of birds through collisions, and the species groups most commonly reported as fatalities include waterfowl, grebes, shorebirds and cranes (Rioux *et al*. 2013). Transmission lines are estimated to be among the greatest sources of mortality to birds by human activities in Canada (Calvert *et al*. 2013).

Potential cumulative mortality from wildlife collisions with turbines and overhead lines exists for some species or guilds (e.g., waterbirds) where potential for collision exists for all types of structures (i.e., transmission lines, distribution lines and wind turbines). For other species or guilds, the potential for collision may be largely limited to turbines or transmission lines. For example, passerines account for a small proportion (~12 %; Bevanger 1998) of reported fatalities with transmission lines, despite their relative abundance compared to other bird groups, but comprise nearly two-thirds of reported fatalities from collisions with wind turbines (Zimmerling *et al*. 2013; Erickson *et al*. 2014). Large bodied birds typically represent only a small percentage (~12 %) of the fatalities at wind energy projects (Zimmerling *et al*. 2013; Erickson *et al*. 2014), while they are often the most susceptible to collisions with transmission lines (Avian Power Line Interaction Committee 2012).

9.5.3.2 Mitigation Measures for Cumulative Effects

During construction the Project and future projects should implement appropriate mitigation measures (e.g., vegetation clearing outside of migratory bird nesting period, pre-construction nest surveys to avoid active nests, monitoring) to reduce or avoid the potential cumulative effects on mortality risk during this phase.

It is expected that SaskPower's siting practices will identify an appropriate route and additional mitigation measures to reduce or avoid collision risk from SaskPower's Outlaw Trail Transmission Interconnection project, and will implement mitigation measures, such as line marking, to reduce collision mortality risk. Additionally, the Project substation location selection was such to minimize the length of the interconnection transmission line, which serves as mitigation to reduce the potential for cumulative change in mortality risk.

9.5.3.3 Residual Cumulative Effects

Given the limited overlap in species guilds with the potential for collision with turbines and power lines, as well as the limited mortality risk resulting from the Poplar River Coal Mine, there is likely to be a small cumulative effect on change in mortality risk as a result of the Project and future projects. Considering the adaptive management approach to mitigating Project-related mortality risk, overall the contributions of future projects within the RAA, including the proposed Project, to wildlife mortality risk are not anticipated to change current wildlife abundance and diversity in the RAA.

9.5.4 Summary of Cumulative Effects Mitigation and Assessment

The residual cumulative environmental effects on the wildlife and wildlife habitat VEC, as well as the contributions of the Project to these residual cumulative effects are summarized in **Table 9-22**.

Table 9-22: Characterization of Residual Cumulative Effects

Criterion	Measure of Residual Cumulative Effect	Contribution from the Project to the Residual Cumulative Effect
Residual Cumulative Change in Wildlife Habitat		
Direction	Adverse	The Project will result in a temporary loss of 37.3 ha during construction, and permanent loss of 3.1 ha of wildlife habitat for the duration of the Project.
Magnitude	Low	The Project contribution to a change in wildlife habitat at the RAA scale represents less than 0.01% of native land cover classes in the RAA. This contribution to the residual cumulative effect is considered negligible.
Geographical Extent	RAA	The Project's contribution to the residual cumulative change in wildlife habitat will be limited to extents of the LAA.
Duration	Permanent	Project contributions to changes in wildlife habitat will be long-term and will occur during construction and extend through decommissioning.
Frequency	Continuous	Wildlife habitat will be affected in a continuous manner in conjunction with other future foreseeable projects within the RAA.
Reversibility	Reversible	Post-reclamation, changes in wildlife habitat are anticipated to be reversible.
Residual Cumulative Change in Wildlife Mortality Risk		
Direction	Adverse	The Project may result in an increase in wildlife mortality risk in the RAA through collision mortality with vehicles and turbines.
Magnitude	Moderate	The mortality risk of the Project will be mitigated through adaptive management approaches that will maintain mortality rates at or below acceptable levels identified in the *Adaptive Management Guidelines for Saskatchewan Wind Energy Projects* (ENV 2018).
Geographical Extent	RAA	The Project's contribution to the residual cumulative change in wildlife mortality risk will extent to the RAA due to migratory species potentially being killed.
Duration	Long-term	The duration of Project effects resulting from the loss of unidentified plant SOMC will occur through the life of the Project, but not beyond.
Frequency	Multiple irregular events	Mortality events associated with the Project will occur during periods of wildlife movement, and will occur as multiple-irregular events.
Reversibility	Reversible	Changes in mortality risk from the Project will be reversible following the decommissioning of the Project.

9.6 Determination of Significance

9.6.1 Significance of Project Residual Effects

Overall, the predicted residual effects on wildlife and wildlife habitat are anticipated to be adverse, low in magnitude, variable in extent from the LAA to RAA, long-term in duration, occur as multiple irregular events. The effects have been largely addressed during Project design by avoiding native land cover classes, and through implementation of appropriate mitigation measures, including prescribed adaptive management guidelines, when avoidance is not possible. Therefore, based on the significance definition criteria provided in **Section 9.1.6,** the residual effects of the Project on wildlife and wildlife habitat are predicted to be not significant.

9.6.2 Significance of Cumulative Effects

The existing conditions within the RAA reflect a landscape that has been broadly and irreversibly modified by the conversion of native land cover for agricultural use and human inhabitation. Based on the measures used to define magnitude in **Table 9-4**, and the criteria used to determine the signi cance of e ects in **Section 9.1.6**, cumula ve e ects on the wildlife and wildlife habitat VEC from previous and ongoing ac vi es in the RAA are high in magnitude and signi cant, despite the Project contribu on to those e ects is not considered measurable at the scale of the RAA. With the contribu ons of the Project-speci c residual e ects, as well as those from other future foreseeable projects, the cumula ve e ects will con nue to be signi cant.

9.7 Prediction Confidence

Based on the information collected during the desktop analysis, observations during field surveys, and the Project team's understanding of Project activities, the predicted confidence in the assessment of potential effects of the Project on wildlife and wildlife habitat is moderate to high. It should be noted that predicting mortality rates from wind energy projects on birds and bats based on pre-construction survey data is shown have low predictive accuracy; however, actual mortality rates will be monitored and an adaptive management approach applied as necessary to meet provincial guidelines. The prediction confidence is based in part on the knowledge that the predicted effects are a conservative estimate, due to the assessment of 37 turbine locations with only 33 sites to be selected for construction, and with the potential to refine the layout during construction to further avoid areas of suitable wildlife habitat (i.e., natural land cover). Some uncertainty exists in the exact degree of change in land cover classes that will occur during Project construction, as additional opportunities for avoidance of natural land cover areas within the PDA may be determined by the construction contractor at the onset of construction. However, there is a high level of confidence in the effectiveness of the mitigation measures proposed in the EPP (see **Appendix C**) for each of the potential residual effects.

9.8 Follow-Up and Monitoring

OTW LP will retain the services of an environmental monitor during construction to evaluate the effectiveness of the mitigation measures related to wildlife and wildlife habitat, and to ensure that the mitigation measures and procedures included in the EPP (see **Appendix C**) are being followed. An adaptive management plan, including mortality monitoring, in accordance with the Adaptive Management Guidelines for Saskatchewan Wind Energy Projects (ENV 2018) will be implemented to determine whether adaptive management approaches are required to mitigate observed mortality rates. Additionally, OTW LP will evaluate the area requiring offsetting to provide a final mitigation for any actual impacts to wildlife and wildlife habitat. Details of this offsetting plan framework are provided in **Appendix C**.

10.0 Assessment of Potential Effects on Heritage Resources

10.1 Scope of Assessment

Heritage resources are defined in this EIS as remnants and features associated with historic and pre-contact archaeological sites, palaeontological resources, and structures of historical and/or architectural significance. Once identified, heritage resources are placed under the administration of the HCB under *The Heritage Property Act* (Government of Saskatchewan 1980b).

Heritage resources are associated with cultural and societal properties of the environment and are considered valuable by the public, Indigenous communities, government agencies, and other stakeholders. Activities associated with the Project have the potential to result in losses of or changes to heritage resources, if present. Protection of heritage resources help to preserve the past and understand Saskatchewan's culture through the preservation of human and/or natural history. As such, heritage resources were included as a VEC in the environmental assessment. The following section details the scope of assessment for heritage resources.

10.1.1 Regulatory and Policy Setting

The HCB is responsible for the administration of *The Heritage Property Act* (Government of Saskatchewan 1980b) and protecting heritage resources by designating these resources as heritage properties. Under Section 23(1)a of the *Heritage Property Act* "No person shall alter, restore, repair, disturb, transport, add to, change or remove, in whole or in part, or remove any fixtures from, without the written approval of the council of the municipality in which the property is situated, any; designated property" and Section 24(1)a "no person shall demolish or destroy in whole or in part, without the written approval of the council of the municipality in which the property is situated, any, designated property."

Proponents are required to inquire with the HCB for all proposed projects, to determine the potential effects on heritage resources. According to Section 63 of *The Heritage Property* Act, the Minister is authorized to require a project proponent to complete an HRIA where a proposed project may result in the alteration, damage or destruction of heritage property. Once completed, a summary of the HRIA is compiled into a technical report and submitted to the HCB for review and determination.

10.1.2 Consideration of Issues Raised During Engagement

No concerns related to the potential effects of the Project on heritage resources were raised during OTW LP's engagement with stakeholders, regulators, landowners and Indigenous communities.

10.1.3 Potential Effects, Pathways and Measureable Parameters

The assessment of potential effects on heritage resources focuses on losses of or changes to these resources as a result of Project activities. Project activities completed during the construction phase that involve ground disturbance or heavy vehicle and/or equipment travel on natural, previously undisturbed lands have the highest potential to impact heritage resources. Heritage resources that are situated on or near the surface have the highest potential to occur in native prairie and wetland land covers, while heritage resources situated below the surface may occur throughout the Project area.

The effect pathways and parameters by which changes to heritage resources can be measured are provided below in **Table 10-1**.

Table 10-1: Potential Effects, Pathways and Measureable Parameters for Heritage Resources

Potential Effect	Effect Pathway	Measurable Parameters
Changes to heritage resources	Loss or alteration of heritage resources as a result of ground disturbance, or by vehicle and/or equipment travel during Project activities	Number of previously documented heritage resources, or those identified within the PDA during the HRIA
		Physical condition of heritage resources within the PDA

10.1.4 Boundaries

10.1.4.1 Spatial Boundaries

Spatial boundaries for heritage resources have been determined based off of the potential for Project activities to have effects on heritage resources within these defined areas. Spatial boundaries are summarized in **Table 10-2** below and presented in **Figure 10-1**.

Table 10-2: Spatial boundaries for the Heritage Resources Effects Assessment

Spatial Boundary	Boundary Description
Project Development Area (PDA)	Includes the Project footprint, which is the anticipated maximum area of physical disturbance associated with the construction and operation phases of the Project. The PDA includes the temporary (i.e., during construction) and permanent areas of physical disturbance.
Local Assessment Area (LAA)	The LAA is defined as the extents of the PDA. The potential effects of the Project on heritage resources are anticipated to be limited to the extents of physical disturbance, which will be contained within the boundaries of the PDA. Therefore, the extents of the LAA will allow for an effective assessment of the potential effects of the Project on heritage resources.
Regional Assessment Area (RAA)	For interpretation reasons; includes the Wood Mountain Plateau and Coteau Lakes Upland landscape areas (Action *et al*. 1998).

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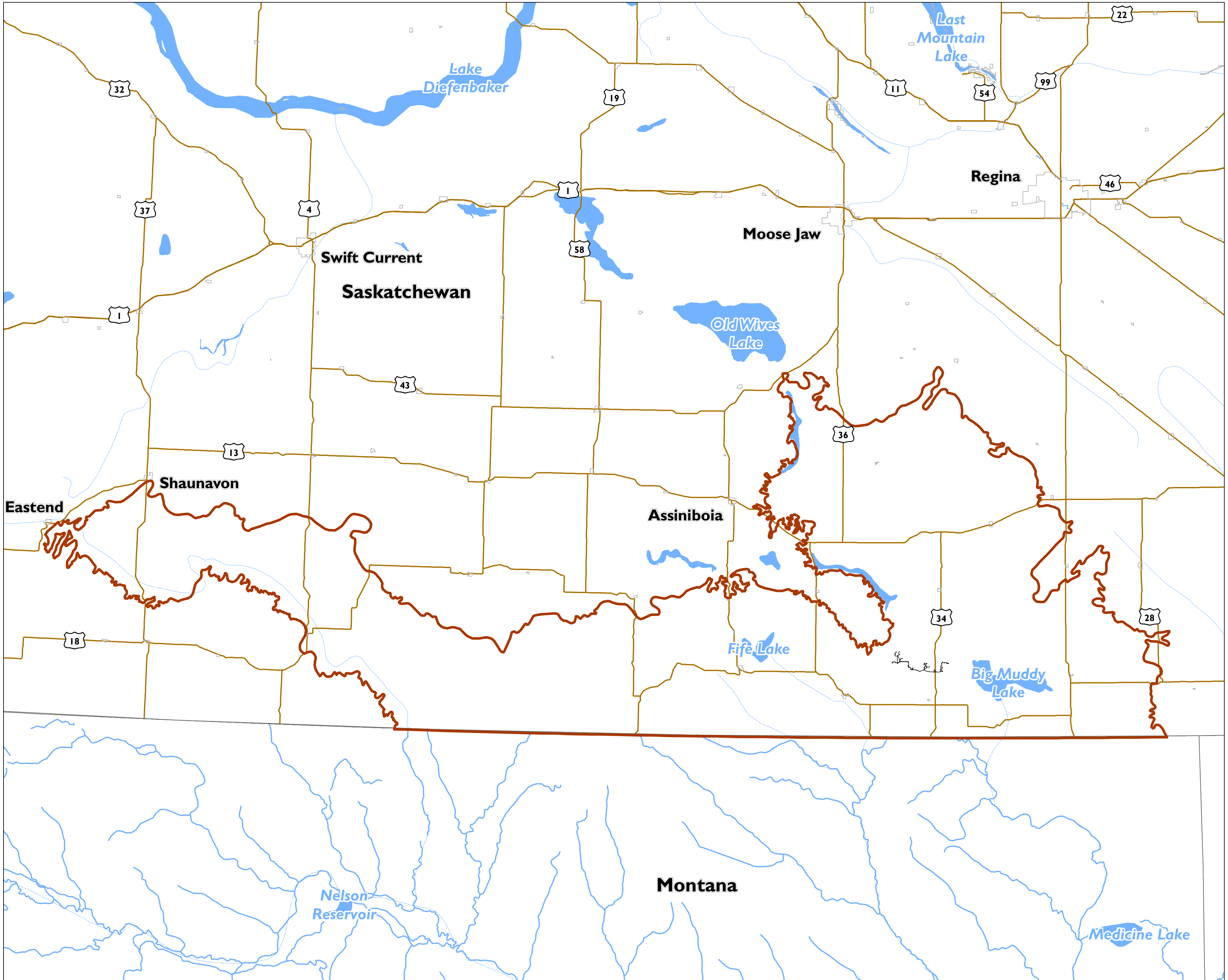
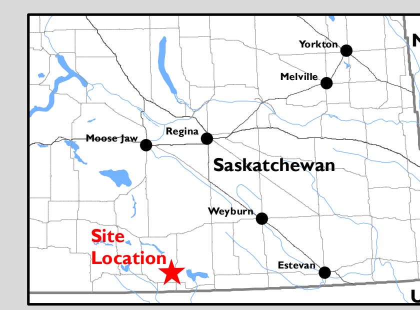
FIGURE 10-1
HERITAGE RESOURCES ASSESSMENT AREAS



Heritage Resources Regional Assessment Area
Project Development Area
Urban Municipality
Provinicial and State Boundaries
Major Roads



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0 10 20 40 Kilometers

MAP DRAWING INFORMATION:

DATA PROVIDED BY CANSIS NATIONAL ECOLOGICAL FRAMEWORK (COTEAU LAKES UPLAND AND WOODLAND MOUNTAIN PLATEAU AREAS), CANVEC, ESRI, GEOSASK & DILLON CONSULTING

MAP CREATED BY PH
MAP CHECKED BY CD

MAP PROJECTION: NAD 1983 UTM Zone 13N

DILLON CONSULTING

PROJECT: 191825
STATUS: FINAL
DATE: 2021-03-01

FILE LOCATION: G:\GIS\2019\191825 - Outlaw Trail Energy Project\Product\Client\EIS\Figure 10_1 Heritage Resources Assessment Areas.mxd

10.1.4.2 Temporal Boundaries

The temporal boundaries for the heritage resources assessment are based on the duration of each phase of the Project, as described below in **Table 10-3**.

Table 10-3: Temporal Boundaries for the Heritage Resources Assessment

Project Phase	Description
Construc on	The anticipated duration of the construction phase is approximately 1.5 years, which includes site preparation, construction of the Project components (e.g., WTGs, access roads, collector lines, substation, operation and maintenance building), reclamation of temporary workspaces, and Project commissioning.
Opera ons and Maintenance	The operation and maintenance phase will commence once the Project is commissioned, and is anticipated to continue for a minimum of 25 years before potential refurbishment or decommissioning may be required.
Decommissioning	The decommissioning phase is anticipated to last approximately six months, which will include the removal of above-ground infrastructure, portions of the concrete foundations, access roads and WTG pads, abandonment of buried collector lines, and reclamation of lands within the PDA to a condition similar to pre-development conditions, and appropriate for the future land use objectives, based on consultation with the landowners and regulatory requirements at that time.

While the temporal boundaries described above are specific to each Project phase in its entirety, potential effects on heritage resource are most likely to occur during activities involving ground disturbance, including vegetation removal, access road construction, WTG and MET tower installation, construction of the substation and installation of collector lines during the construction phase.

10.1.5 Residual Effects Characterization

Project-specific residual effects on heritage resources are characterized based on their occurrence throughout the life of the Project. Project effects that result in permanent, destructive and/or non-reversible disturbance of heritage resources, in which mitigation as determined by the HCB have not been applied, are considered adverse residual effects. As directed by the HCB, mitigation measures on heritage resources may include avoidance and establishment of appropriate setback distances, or excavation of known heritage resource sites. Heritage resources discovered during Project activities will be avoided or excavated under the direction of the HCB at that time. Therefore, as residual effects are characterized is either occurring or not occurring, additional characterization criteria are not required.

10.1.6 Significance Definition

A determina on of signi cance is assigned to an adverse residual effect that results in permanent, destructive and/or non-reversible disturbance of known or discovered heritage resources, in which mitigation as determined by the HCB have not been applied.

10.2 Existing Conditions for Heritage Resources

The purpose of this section is to describe the existing environmental setting within the LAA as a basis to assess the potential effects of the Project on heritage resources. The methods by which data on the existing conditions were collected, and the results of the data collection are summarized below.

10.2.1 Methods

10.2.1.1 Desktop Review

A desktop review of the lands on which the Project is located was completed for heritage sensitivity, based on information provided by the HCB screening criteria and Online Developer's Screening Tool (Government of Saskatchewan 2018). A heritage referral was subsequently submitted to the HCB, for a heritage resource review of the Project (HCB File No. 18-324). As the final PDA layout had not yet been determined at the time of the Project referral for heritage resource review, a larger area than would be required for the Project was submitted for review. The HCB reviewed the areas provided in the referral against locations of previously recorded archaeological sites, the heritage resource potential of the Project area, the nature and extent of previous land disturbance (e.g., cultivation) and the scope of the Project. The HCB issued a summary of their heritage resource review (see **Appendix J**), which identified 85 quarter sections as heritage sensitive and requiring a HRIA. Once the initial layout of the PDA was determined, the quarter sections on which the PDA was situated were reviewed against the results of the heritage resource review, and determined that 32 of the quarter sections identified as heritage sensitive would be impacted by the PDA and require a HRIA.

In 2020, Atlheritage Services Corp. (Atlheritage) submitted a subsequent referral for heritage resource review to the HCB based on an earlier Project layout version (HCB File No. 20-247). The HCB identified areas of hummocky undisturbed native prairie near seasonal water sources and drainage coulees associated with the Big Muddy Valley within the referral area have moderate to high potential to contain archaeological sites, and determined that a HRIA would be required for all areas of native prairie that would be impacted by Project infrastructure.

10.2.1.2 Heritage Resource Impact Assessment

Atlheritage completed a HRIA for all areas of native prairie within the PDA under an Archaeological Resource Investigation Permit issued by the HCB (Permit No. 20-0118). Following a revision to the PDA, in which the collector line routes were revised, a supplementary HRIA was completed to account for additional areas that were not included in the initial HRIA. The subsequent HRIA was completed under Archaeological Resource Investigation Permit No. 20-114.

The HCB's Saskatchewan Archaeological Site Inventory was reviewed to identify all known heritage resources within 1 km of the PDA. The findings from the review informed the design of a field assessment to identify heritage resources that are in conflict with the Project.

The field assessment consisted of a combination of systematic pedestrian reconnaissance and excavation of subsurface shovel probes at locations within the PDA. The pedestrian reconnaissance focused on identifying and investigating surface features (e.g., stone circles, stone cairns and cellar depressions), artifacts exposed on the surface and subsurface exposures (e.g., tree throws, trails and cut- banks). Shovel probes were completed in areas of the PDA considered to have high heritage resource potential to determine if subsurface artifacts/features were present. Shovel probe excavations typically measure 40 centimetres (cm) by 40 cm in area, and are excavated until the subsoil horizon or glacial till layer is encountered. If surficial and /or buried archaeological sites or features are discovered in conflict with the PDA, they are tested, photographed, mapped in detail and included for discussion in the HRIA report.

The HRIA methods are described in further detail in the HRIA report prepared for the Project under Archaeological Resource Investigation Permit No. 20-114 (see **Appendix J**). This report also includes a discussion on the findings from the HRIA completed under Permit No. 20-018.

10.2.2 Results

10.2.2.1 HRIA Desktop Review

The HCB's Saskatchewan Archaeological Site Inventory review completed under Permit no. 20-114 identified 17 known heritage resource sites within 1 km of the PDA, including two sites that were discovered during the HRIA completed under Permit No. 20-018 (see **Section 10.2.2.2**). A summary of the known heritage resource sites is provided in **Table 10-4**.

Table 10-4: Known Heritage Resources within 1 km of the PDA

Borden Number	Site Type	Period	Permit Number
DhNg-5	Recurrent Feature	Precontact	90-028:00
DhNg-6	Recurrent Feature	Precontact	90-028:00
DhNg-40	Single Feature	Precontact	97-000:00
DhNh-1	Artifact/Feature Combination	Late Precontact	60-000:00
DhNh-2	Artifact/Feature Combination	Precontact	62-000:00
DhNh-12	Single Feature	Precontact	87-000:00
DhNh-14	Single Feature	Precontact	89-015:00
DhNh-15	Single Feature	Precontact	89-015:00
DhNh-16	Recurrent Feature	Precontact	89-015:00
DhNh-44	Recurrent Feature	Precontact	97-000:00
DhNh-45	Recurrent Feature	Precontact	97-000:00
DhNh-47	Single Feature	Precontact	97-000:00
DhNh-54	Artifact Find	Precontact	17-197:00

Borden Number	Site Type	Period	Permit Number
DhNh-55	Single Feature	Precontact	17-197:00
DhNh-56	Artifact Find	Precontact	17-197:00
DhNh-57	Multiple Feature	Historic (European)	20-018:00
DhNh-58	Recurrent Feature	Precontact	20-018:00

10.2.2.2 HRIA Field Assessment

During the field assessment completed under Permit No. 20-018, two archaeological sites were discovered in conflict with the collector line routes: DhNh-57 and DhNh-58. The remains of a European Homestead dating to *c*. 1918 was discovered at DhNh-57, and three stone circles were identified at DhNh-58.

Following the completion of the initial HRIA, the PDA was revised, and the collector lines were subsequently rerouted in the final PDA layout to avoid these sites. The subsequent HRIA field assessment was completed on September 30, 2020 to investigate areas of the final PDA that were not included in the previous field assessment. No surficial or buried artifacts, features or paleosols were discovered during the field assessment.

10.3 Project Interactions with Heritage Resources

A summary of the interactions between specific Project activities and heritage resources, and the potential effects that may result from these interactions, are included below in **Table 10-5**.

Table 10-5: Summary of Project Interactions with Heritage Resources

Project Activities	Environmental Effects
	Changes to Heritage Resources
Construction Phase	
Site preparation, including vegetation clearing, topsoil stripping, grading and development of WTG locations, MET tower locations, access roads, substation and temporary workspaces	✓
Installation of WTG and MET tower foundations; erection of WTGs and MET towers	✓
Installation of collector lines and substation infrastructure	✓
Post-construction reclamation of temporary workspaces	✓

Project Activities	Environmental Effects
	Changes to Heritage Resources
Operation and Maintenance Phase	
Operation and use of WTGs, MET towers, substation and access roads	-
Routine and unplanned maintenance of WTGs and substation infrastructure	-
Routine and unplanned maintenance of collector lines, substation infrastructure and access roads	-
Decommissioning Phase	
Dismantling and removal or Project infrastructure, including WTGs, collector lines, substation infrastructure and access roads	-
Site reclamation	-

Note: ✓ denotes a potential interaction; – denotes no interaction.

Interactions between Project activities and heritage resources will be limited to ground disturbance activities during the construction phase of the Project. Project activities during the operation and maintenance phase, and decommissioning phase will occur within the locations previously disturbed during the construction phase; therefore, no effects on heritage resources during the operation and maintenance phase and decommissioning phase are anticipated to occur.

10.4 Assessment of Residual Environmental Effects on Heritage Resources

10.4.1 Analytical Assessment Techniques

The assessment of potential effects of the Project on heritage resources was completed by using the data collected during the desktop review to identify the locations of previously documented heritage resource sites, as well as data collected during the HRIAs where new heritage resource sites were found. These site locations are then compared to the extents of the PDA to determine if they may be directly disturbed by Project activities.

10.4.2 Change to Heritage Resource Sites

10.4.2.1 Effect Pathways

Construction Phase

Project activities during the construction phase may result in destruction or displacement of heritage resources. Activities including vegetation clearing, topsoil stripping and vehicle and equipment travel may result in displacement or destruction of surficial or shallowly-buried heritage resources. Also, activities including grading, excavating soil to accommodate WTG foundations, and trenching collector line routes may result in displacement or destruction of buried heritage resources.

10.4.2.2 Mitigation Measures

Through the various iterations of the Project layout, avoidance of heritage resources has been the preferred mitigation measure. Heritage resources detected were considered and avoided in subsequent revisions of the Project. Following revisions to achieve the final layout, no known heritage resources are in conflict with the Project. Therefore, no additional mitigation measures (e.g., avoidance) were recommended in the HRIA. The HCB reviewed the HRIA report and issued a clearance letter on November 30, 2020, confirming their acceptance of the findings and recommendations from the HRIA (see **Appendix J**).

The following mitigation measures have been included in the EPP (see **Appendix C**) and will be implemented during construction to address potential changes to heritage resources:

- Boundaries of equipment and vehicle travel, and the extents of vegetation clearing will be clearly marked in native land cover classes (i.e., undisturbed areas with potential to encounter heritage resources) prior to construction; no disturbance will be permitted in areas beyond these boundaries; and
- In the event that a previously undiscovered artifact or feature is encountered during construction, work in the area will be suspended and the discovery will be reported to OTW LP and the environmental monitor. The HCB will be contacted, and work in the area will not resume until advised by OTW LP.

10.4.2.3 Predicted Residual Effects

Through the application of mitigation measures, industry BMPs and compliance with the *Heritage Property Act* (Government of Saskatchewan 1980b), no residual effects on heritage resources as a result of the Project are anticipated.

10.5 Assessment of Cumulative Environmental Effects on Heritage Resources

As discussed above, through the application of mitigation measures, industry BMPs and compliance with the *Heritage Property Act* (Government of Saskatchewan 1980b), no residual effects on heritage resources as a result of the Project are anticipated; therefore, there is no potential for cumulative effects on heritage resources with other past, present and foreseeable future projects.

10.6 Determination of Significance

10.6.1 Significance of Project Residual Effects

Based on the findings of the HRIA and with the application of the proposed mitigation measures, the Project will comply with the *Heritage Property Act* (Government of Saskatchewan 1980b) and the regulatory conditions set forth by the HCB. Therefore, based on the significance definition criteria provided in Section 10.1.6, there will be no significant effects of the Project on heritage resources.

10.6.2 Significance of Cumulative Effects

No Project residual effects on heritage resources are anticipated; therefore there are no cumulative effects.

10.7 Prediction Confidence

Based on the information collected during the desktop review and provided by the HCB, as well as the methods and results of the HRIA that evaluated all areas of potential heritage resources within the PDA, the predicted confidence in the assessment of potential effects of the Project on heritage resources is high. Due to its size, and the methods used when conducting the HRIA, it was not possible to assess the entirety of the PDA for the presence of heritage resources, however, areas not assessed included areas of previously-disturbed lands. Nonetheless, environmental protection measures to account for a potential encounter with a previously undiscovered artifact or feature has been included in the EPP (see **Appendix C**).

10.8 Follow-Up and Monitoring

The Project is not anticipated to result in residual effects on heritage resources. Therefore, no follow-up and monitoring programs are proposed.

11.0 Assessment of Potential Effects on Employment and Economy

11.1 Scope of Assessment

For the purposes of the EIS, employment and economy are defined as labour-force, job and training opportunities, income, tax revenue, and contributions to Gross Domestic Product (GDP). The Project will create employment, training and business opportunities, increase spending at existing businesses, generate tax revenue for governments and contribute to the provincial and federal GDP. As such, employment and economy were jointly selected as a VEC in this EIS. The following section details the scope of assessment for employment and economy.

11.1.1 Regulatory and Policy Setting

There are no federal or provincial regulations or policies that define guidelines specific to employment and economy, to which a project must adhere. As such, the scope of the assessment of potential effects on employment and economy takes into account guidance included in the *Environmental Assessment Act, 1980* (Government of Saskatchewan 1980a) and the TOR (Dillon 2019) that was prepared for the Project.

11.1.2 Consideration of Issues Raised During Engagement

During the engagement process, several comments and questions related to employment and economy were raised by landowners and other attendees of the open houses. A summary of the relevant questions and comments is provided below:

- A local landowner expressed interest in the Project and the possibility of having Project components located on his land for the purpose of compensation;
- Interested individuals inquired about the number of job opportunities that would be generated by the Project;
- One individual was interested in opportunities to financially invest in the Project;
- A discussion was held regarding how the Project may impact tourism in the area, and the potential to have the Project incorporated into existing guided tours; and
- A discussion was held regarding how the Project may benefit local communities.

The comments and questions provided during the engagement program with regard to employment and economy were positive and in support of the Project and the opportunities is will bring to the area. Additional information about how the Project will address these concerns about employment and the economy are provided **Section 11.1.5.**

11.1.3 Potential Effects, Pathways and Measureable Parameters

The primary considerations included in the assessment of potential effects of the Project on employment and economy are potential changes to the local or regional workforce and changes to the economy, which were assessed for all phases of the Project.

The effect pathways and parameters by which changes to employment and economy can be measured are provided below in **Table 11-1**.

Table 11-1: Potential Effects, Pathways and Measurable Parameters for Employment and Economy

Potential Effect	Effect Pathway	Measurable Parameters
Changes to local or regional workforce	Employment opportunities created during all phases of the Project	Number of individuals employed for the Project
		Local unemployment rate
		Labour availability by industry
		Wage inflation resulting from the Project
Changes to the economy	Project expenditures on goods and services	Local and regional spending associated with the Project
		Contribution by the Project to federal and provincial GDP
	Contributions to government revenue from the Project	Government revenue generated by the Project

11.1.4 Boundaries

11.1.4.1 Spatial Boundaries

Spatial boundaries for employment and economy have been determined based on the potential for Project activities to have effects on employment and economy within these defined areas. The spatial boundaries are summarized in **Table 11-2** below.

Table 11-2: Spatial boundaries for Employment and Economy

Spatial Boundary	Boundary Description
Project Development Area (PDA)	Includes the Project footprint, which is the anticipated maximum area of physical disturbance associated with the construction and operation phases of the Project. The PDA includes the temporary (i.e., during construction) and permanent areas of physical disturbance.
Local Assessment Area (LAA)	The LAA is defined as the extents of the PDA and the RM's in which the Project is located (i.e., Happy Valley [RM No. 10] and Hart Butte [RM No. 11]), as well as the communities beyond the RMs from which the Project workforce, services, and materials may be procured. This includes the Towns of Willow Bunch, Bengough, and Assiniboia.

Spatial Boundary	Boundary Description
Regional Assessment Area (RAA)	The RAA includes the communities located within the LAA, as well as those located within the Canadian census economic regions of Swift Current-Moose Jaw Census Division (CD) No. 3 and Regina-Moose Mountain CD No. 2.

The employment and economy spatial boundaries are presented in **Figure 11-1**.

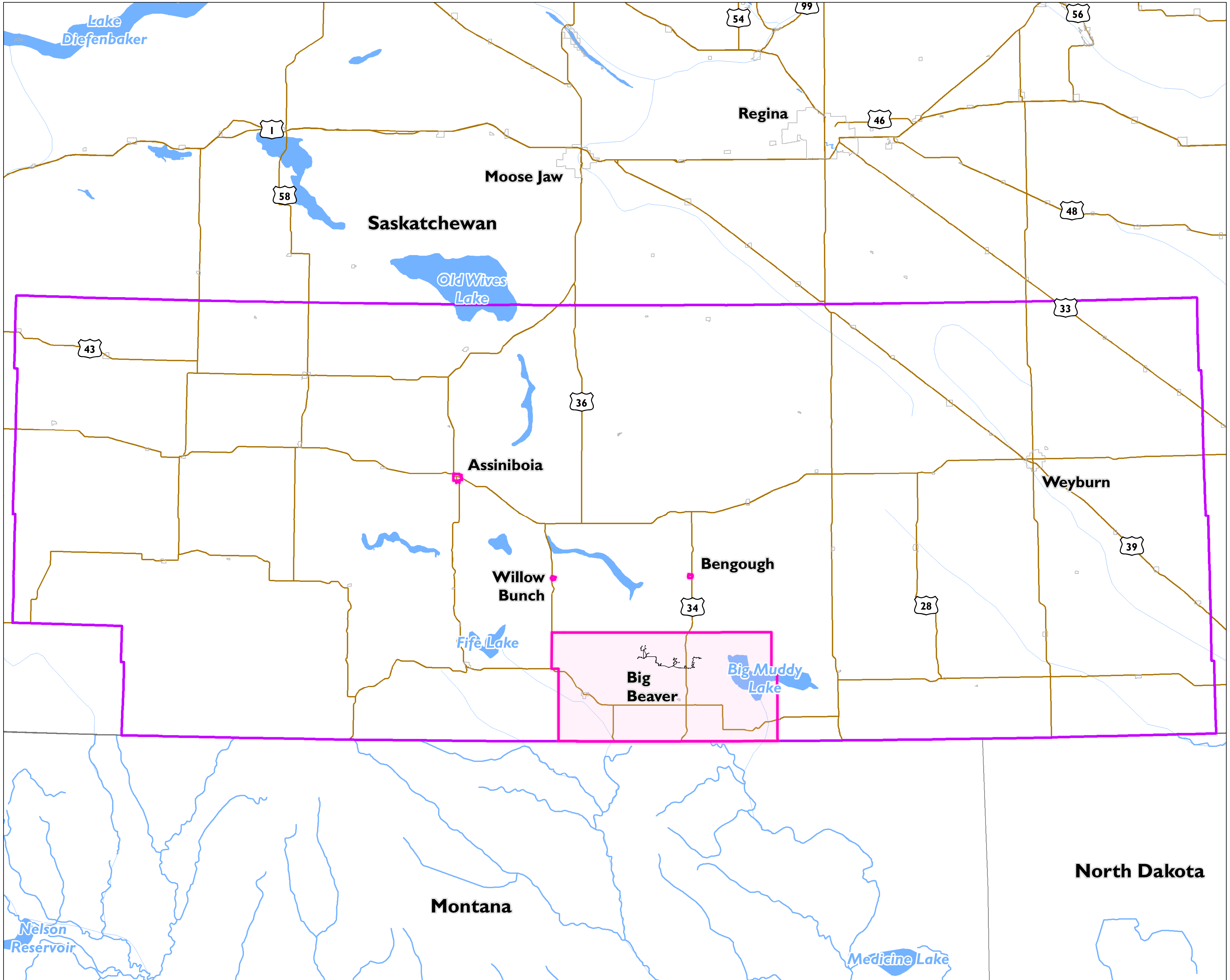

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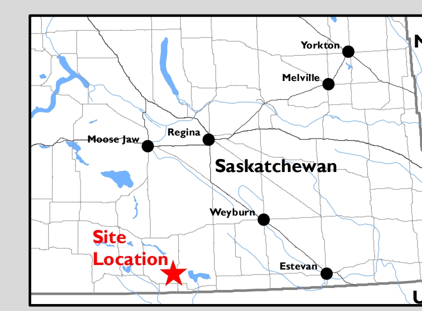
FIGURE 11-1
EMPLOYMENT AND ECONOMY ASSESSMENT AREAS

- Project Development Area
- Employment and Economy Local Assessment Area
- Employment and Economy Regional Assessment Area
- Urban Municipality
- Provinicial and State Boundaries
- Major Roads



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0 10 20 40 Kilometers

MAP DRAWING INFORMATION:
DATA PROVIDED BY CANVEC, ESRI, GEOSASK & DILLON CONSULTING

MAP CREATED BY PH
MAP CHECKED BY CD

MAP PROJECTION: NAD 1983 UTM Zone 13N ROTATION: -0.25°

PROJECT: 191825
STATUS: FINAL
DATE: 2021-03-01

FILE LOCATION: G:\GIS\2019\191825 - Outlaw Trail Energy Project\Product\Client\EIS\Figure 11_1 Employment and Economy Assessment Areas.mxd

11.1.4.2 Temporal Boundaries

Temporal boundaries for employment and economy have been determined based on the phases of the Project that have the potential for varying effects on employment and economy throughout different temporal periods based on their level of disturbance. Temporal boundaries are summarized in **Table 11-3** below:

Table 11-3: Temporal Boundaries for Employment and Economy

Project Phase	Description
Construc on	The anticipated duration of the construction phase is approximately 1.5 years, which includes site preparation, construction of the Project components (e.g., WTGs, access roads, collector lines, substation, operation and maintenance building), reclamation of temporary workspaces, and Project commissioning.
Opera ons and Maintenance	The operation and maintenance phase will commence once the Project is commissioned, and is anticipated to continue for a minimum of 25 years before potential refurbishment or decommissioning may be required.
Decommissioning	The decommissioning phase is anticipated to last approximately six months, which will include the removal of above-ground infrastructure, portions of the concrete foundations, access roads and WTG pads, abandonment of buried collector lines, and reclamation of lands (including soils) within the PDA to a condition similar to pre-development conditions, and appropriate for the future land use objectives, based on consultation with the landowners and regulatory requirements at that time.

11.1.5 Residual Effects Characterization

The residual effects on employment and economy are characterized using the terms and criteria that are summarized in **Table 11-4**.

Table 11-4: Characterization of Residual Effects Evaluation Criteria for Employment and Economy

Characterization	Description	Quantitative Measures or Definition of Qualitative Categories
Direction	The long-term trend of the residual effect on employment and economy	**Positive:** effect that moves parameters in a direction beneficial to employment and economy relative to baseline conditions. **Adverse:** effects that moves parameters in a direction adverse to employment and economy relative to baseline conditions. **Neutral:** no change in parameters for employment and economy relative to baseline conditions.

Characterization	Description	Quantitative Measures or Definition of Qualitative Categories
Magnitude	The degree of change in measurable parameters of employment and economy in comparison to existing conditions	**Negligible:** no measurable change in employment and economy relative to baseline conditions. **Low:** A measurable but not substantial change in employment and economy relative to baseline conditions. **Moderate:** a measurable and comparable change in employment and economy relative to baseline conditions. **High:** confirmed measurable change in employment and economy relative to baseline conditions.
Geographic Extent	Geographic area in which residual effects on employment and economy may occur	**PDA:** effects occur only in the PDA. **LAA:** effects occur in the PDA and the LAA. **RAA:** effects occur in the PDA, LAA and RAA.
Duration	Period of time required until the measurable parameters of employment and economy return to existing conditions, or the effect can no longer be measured	**Short-term:** effects occur only during the activity **Medium-term:** effects extend from construction and up to 10 years into maintenance and operation; effects extend throughout maintenance and operation. **Long-term:** effects extend through all phases of the Project and closure. **Permanent:** effects extend after closure of the Project and are unlikely to recover.
Frequency	Number of occurrences of a residual effect over a period of time	**Single event:** event occurs once. **Multiple irregular events:** event occurs sporadically and/or intermittently. **Multiple regular events:** event occurs repeatedly and/or regularly. **Continuous:** event occurs continuously**.**
Reversibility	The likelihood of a changed measureable parameter of a residual effect to return to a baseline condition upon cessation or completion of a Project phase or activity	**Reversible:** effect expected to return to baseline conditions with activity completion and reclamation. **Irreversible:** effect unlikely to return to baseline conditions.

11.1.6 Significance Definition

A determination of significance is assigned to the residual effects on employment and economy that remain after mitigation measures have been implemented. The criteria used to determine the significance of environmental effects on employment and economy include:

- Effects that will result in measureable net change in employment rates that are distinguishable from the overall trends and conditions within the LAA or RAA; and
- Effects that will result in measurable net change in provincial GDP or government revenue that are distinguishable from the overall trends and conditions within the LAA or RAA.

While the assessment of residual effects will consider both positive and adverse effects of the Project, as well as any proposed mitigation measures and management strategies, the significance of the effects will only be determined for adverse effects.

11.2 Existing Conditions for Employment and Economy

The purpose of this section is to describe the existing environmental setting within the LAA as a basis to assess the potential effects of the Project on employment and economy. The methods by which data on the existing conditions were collected, and the results of the data collection are summarized below. Data collected for this VEC are presented at the scale of the LAA and RAA, given that there are no relevant data available at the PDA level. No field studies were required to complete this assessment.

11.2.1 Methods

The existing setting of employment and economy is described using data obtained, when available, from Statistics Canada's 2011 National Household Survey (NHS; Statistics Canada 2013) and 2016 Census (Statistics Canada 2017). These data were used to describe the status of population, labour force, employment types, levels of education and annual income within the LAA and RAA, and identify trends in population change between the 2011 NHS and 2016 Census.

11.2.2 Results

11.2.2.1 Population

The population within the LAA decreased by 5.1% between the 2011 and 2016 Census whereas the population within the RAA had an opposite trend and increased by 7.0% during this time. This pattern of population change is indicative of the shift from rural populations in Saskatchewan to a more urban population where growth is occurring in the cities across the Province and decreasing in the rural communities. No aboriginal population was present in the RM of Happy Valley or in the RM of Hart Butte in 2016. A summary of LAA, RAA and provincial population trends is summarized in **Table 11-5** below (Statistics Canada 2017).

Table 11-5: Population Statistics for 2011 and 2016

Assessment Area	Total Population				
	2011 Population	2016 Population	Population Change (%)	2016 Population	Population Change (%)
RM of Happy Valley	148	139	-6.1		
RM of Hart Butte	264	252	-4.5		
Town of Bengough	313	332	6.1	0	0
Town of Willow Bunch	286	272	-4.9		
Town of Assiniboia	2,418	2,389	-1.2	120	118.2
LAA	412	391	-5.1		
RAA	391,525	418,805	7.0		

Source: Statistics Canada 2013, Statistics Canada 2017.

11.2.2.2 Labour Force

In 2016, the available labour force was described as an individual living in the spatial boundary (LAA or RAA) over the age of 15. The actual labour force are those currently employed or seeking employment. The labour force within the LAA (1,795 individuals) had an unemployment rate of 3.3% in 2016, while the labour force within the RAA (232,495 individuals) had a slightly higher unemployment rate of 5.7% in 2016. A summary of LAA and RAA labour metrics are summarized in **Table 11-6** below (Statistics Canada 2017).

Table 11-6: Labour Force Statistics for 2016

Labour Metric	LAA	RAA
Population over 15 years of age	2,825	330,925
Labour Force	1,795	232,495
Employed	1,740	2192,90
Unemployed	60	13,215
Unemployment Rate (%)	3.3%	5.7%

Source: Statistics Canada 2017.

11.2.2.3 Employment by Industry

There is a similar range of industry sectors that support employment within the LAA and the RAA (**Table 11-7**). Generally, there are similar proportions of individual working in each of the sectors when comparing the LAA to the broader RAA; though at the LAA scale agriculture (identified as agriculture, forestry, fishing and hunting in **Table 11-7**) are more than double the proportion found at the RAA. There are a relatively higher proportion (3% vs. 1%) of individual working in the Utilities sector within the LAA, which is attributed to employment at the Poplar River power station and coal mine near Coronach (**Table 11-7**).

Table 11-7: Industry Statistics for 2016

Industry	LAA		RAA	
	Total	Percent	Total	Percent
Agriculture, forestry, fishing and hunting	390	22%	20,370	9%
Mining, quarrying and oil and gas extraction	75	4%	7,795	3%
Utilities	50	3%	3,290	1%
Construction	110	6%	18,710	8%
Manufacturing	35	2%	10,205	4%
Wholesale trade	105	6%	8,690	4%
Retail trade	265	15%	24,655	11%
Transportation and warehousing	30	2%	9,825	4%
Information and cultural industries	10	1%	5,330	2%
Finance and insurance	70	4%	10,520	5%
Real estate and rental and leasing	10	1%	3,195	1%
Professional, scientist and technical services	70	4%	10,370	5%
Management of companies and enterprises	0	0%	385	0%
Administrative support, waste management and remediation services	45	3%	6,575	3%
Educational services	65	4%	14,890	6%
Health care and social assistance	165	9%	27,355	12%
Arts, entertainment and recreation	40	2%	4,575	2%
Accommodation and food services	90	5%	15,175	7%
Other services	60	3%	10,145	4%
Public administration	85	5%	17,585	8%
Totals	1785	100%	229,650	100%

Source: Statistics Canada 2017.

11.2.2.4 Employment by Occupation

In 2016, the labour force within the LAA was dominated by individuals employed in sales and service (22%), management (20%) and trades, transportation and equipment operator roles (17%) (**Table 11-8**). The distribution of occupations at the RAA level were similar, though management roles were balanced out with business, finance and administration roles were each accounted for 15% of the workforce. Other occupations at each spatial scale are presented in **Table 11-8**.

Table 11-8: Occupation Statistics for 2016

Occupation	LAA		RAA	
	Total	Percent	Total	Percent
Management	360	20%	33,935	15%
Business, finance and administration	200	11%	35,530	15%
Natural and applied sciences	50	3%	12,540	5%
Health	135	8%	15,725	7%
Education, law and social, community and government	85	5%	23,390	10%
Art, culture, recreation and sport	10	1%	4,620	2%
Sales and service	390	22%	49,350	21%
Trades, transportation and equipment operators	300	17%	37,950	17%
Natural resources, agriculture and production	170	9%	10,405	5%
Manufacturing and utilities	60	3%	6,195	3%
Not applicable	30	2%	5	0%
Total	1,790	100%	229,645	100%

Source: Statistics Canada 2017.

11.2.2.5 Education

In 2016, the labour force within the LAA was dominated by individuals with a high school diploma or equivalent certificate at 35% followed by 21% of individuals having a college or other non-university degree and apprenticeship or trade certificate or diplomas (18%) (**Table 11-9**). The largest contrast with the broader RAA was a lower proportion of the population with university degrees, which is consistent with broader statistics for the entire Province (Statistics Canada 2017). This difference is typical of a reflection of a more rural population within the LAA, versus the RAA, which includes large urban centers (i.e., Swift Current, Moose Jaw, and Regina). Note that for the purposes of comparing education, labour force data were selected for individuals of age 25 or greater to reflect when education would largely be completed.

Table 11-9: Education Statistics for 2016

Education	LAA		RAA	
	Total	Percent	Total	Percent
No certificate, diploma or degree	185	11%	22,355	10%
High school diploma or equivalent certificate	590	35%	69,625	31%
Apprenticeship or trades certificate or diploma	300	18%	25,575	12%
College, CEGEP or other non-university certificate or diploma	355	21%	43,015	19%

Education	LAA		RAA	
	Total	Percent	Total	Percent
University certificate or diploma below bachelor level	75	4%	8,235	4%
University certificate, diploma or degree at bachelor level or above	190	11%	52,340	24%
Total	1695	100%	221,145	100%

Source: Statistics Canada 2017.

11.2.2.6 Annual Income

Statistics Canada reports the 2016 Census for total income as all forms of income obtained before income tax and deductions during 2015. Employment income refers to all wages, salaries and commission from paid employment during 2015. During the 2016 census period, the average median total income of geographic regions included in the LAA was $70,323, while the average of median employment income was $62,328. This is slightly lower, but comparable to the average median total and after tax income within the RAA of $76,032 and $66,088, respectively (**Table 11-10**). Values for each of the areas included in the LAA and RAA are provided in **Table 11-10** for geographic comparison and to demonstrate regional differences. Within the LAA, median income was generally similar with exception of the RM of Hart Butte, which had a substantially higher income (**Table 11-10**). This, again, is likely driven by employment at the Poplar River power station and coal mine, which is slated to be closed by 2030. Median before and after tax income in this area was higher than that of the broader RAA as well, which are similar to levels across the entire Province (Statistics Canada 2017).

Table 11-10: Income Statistics for 2016

Spatial Boundary	Median Total Income ($)	Median Employment Income ($)
RM of Happy Valley	62,080	54,976
RM of Hart Butte	92,928	80,128
Town of Bengough	72,960	67,328
Town of Willow Bunch	62,592	55,424
Town of Assiniboia	61,056	53,786
LAA Average	**70,323**	**62,328**
Swift-Current-Moose Jaw Economic Region	69,352	61,147
Regina-Moose Mountain Economic Region	82,712	71,029
RAA Average	**76,032**	**66,088**

Source: Statistics Canada 2017.

11.3 Project Interactions with Employment and Economy

The assessment of potential effects on employment and economy focuses on changes in the local workforce and economy as a result of Project activities. All Project activities identified will require labour and/or materials, which will result in potential effects to this valued component. The effect pathways and parameters by which changes to employment and the economy can be measured are provided below in **Table 11-11**.

Table 11-11: Summary of Project Interactions with Employment and Economy

Project Activities	Potential Environmental Effects	
	Changes in Local or Regional Workforce	Change in Economy
Construction Phase		
Site preparation, including vegetation clearing, topsoil stripping, grading and development of WTG locations, MET tower locations, access roads, substation and temporary workspaces	✓	✓
Installation of WTG and MET tower foundations; erection of WTGs and MET towers	✓	✓
Installation of collector lines and substation infrastructure	✓	✓
Post-construction reclamation of temporary workspaces	✓	✓
Operation and Maintenance Phase		
Operation and use of WTGs, MET towers, substation and access roads	✓	✓
Routine and unplanned maintenance of WTGs and substation infrastructure	✓	✓
Routine and unplanned maintenance of collector lines, substation infrastructure and access roads	✓	✓
Decommissioning Phase		
Dismantling and removal or Project infrastructure, including WTGs, collector lines, substation infrastructure and access roads	✓	✓
Site reclamation	✓	✓

11.4 Assessment of Residual Environmental Effects on Employment and Economy

11.4.1 Analytical Assessment Techniques

To characterize the residual effects of the Project on employment and economy at the LAA and RAA scales, several metrics were evaluated.

To determine the potential change in the local and regional workforce, the following information was considered:

- The reported unemployment rates at the LAA and RAA scales were evaluated in relation to the anticipated workforce by relevant occupation required during each Project phase;
- Project related expenditures on goods and services were considered as a contribution to the labour workforce in supporting occupations and services; and
- The potential for wage increases and changes in the LAA and RAA were considered for potential effects to the broader communities of the LAA and RAA.

To determine the potential change in the economy, in addition to the changes in the local and regional workforce, which will have stimulating indirect economic effects, direct effects on the economy were measured through changes in local and provincial government GDP and revenue.

In addition to these metrics evaluated, the value-added community benefits identified for the Project by OTW LP (**see Appendix K.1**) were considered in the broader context of benefits to employment and the economy, as well as the community as a whole.

11.4.2 Change in Local and Regional Workforce

11.4.2.1 Effect Pathways

The effect pathways of the Project that can cause a change in local and regional workforce are similar for the construction, operation and maintenance, and decommissioning phases, though they will vary in magnitude among them. These effect pathways are as follows:

- Project activities will result in direct employment to meet labour needs;
- Goods and services to construct, operate and maintain, and decommission the project will create indirect employment;
- The indirect purchase of goods and services by those directly involved in the Project could create additional indirect employment; and
- Project-related direct and indirect employment could result in wage inflation through competition for labour.

11.4.2.2 Mitigation Measures

OTW LP has identified value-added community benefits, including economic and employment benefits for the region (**Appendix K.1**). They have also engaged with the local community, the business community, as well as attended meetings related to the future economic strategy for the region (**Appendix K.2**). As effect pathways of the Project on the local and regional workforce are all positive in direction, given the anticipated loss of employment at the Poplar River Coal Mine and SaskPower generating station, no mitigation measures were identified to reduce or avoid adverse residual effects.

11.4.2.3 Predicted Residual Effects

Construction

Labour and employment needs for the Project will be highest during the construction phase of the Project. The anticipated direct labour force required to provide direct labour and services will be approximately 132 FTEs (275,000 person hours) during construction (**Table 11-12**).

OTW LP is committed to maximizing the workforce sourced from the LAA and RAA to provide economic benefits for the region. However, some positions will require specialized training and workforce that may require being sourced outside the LAA and RAA. The proportion of the workforce originating from these areas is uncertain, as it will depend on available local workforce at the time of construction. As indicated in **Appendix K.1**, OTW LP also provides scholarships and other community benefits that assist in the local community to become involved in the Project and benefit socially and economically from it.

Table 11-12: Projected labour requirements by occupation type

Occupation Type	Labour Demand	
	Construction	Operation and Maintenance
Business, finance and administration	13	4
Trades, transport, and equipment operators	112	7
Natural and applied sciences and related	7	1
Total	132	12

Given the predicted residual effects of the Project during the construction phases, the residual effects are characterized in **Table 11-13**.

Table 11-13: Characterization of Residual Effects on Local and Regional Workforce during Project Construction

Criterion	Measure	Description
Direction	Positive	There will be an increase in employment opportunities
Magnitude	Moderate	There will be a measurable change in employment opportunities as a result of Project construction

Criterion	Measure	Description
Geographical Extent	RAA	Effects on the labour force will extend beyond the LAA and be measurable at the scale of the RAA
Duration	Short-term	Effects of Project construction on the workforce will limited to the construction phase
Frequency	Multiple Regular Events	Effects of Project construction on the workforce will be multiple regular events that will last through the entire phase.
Reversibility	Reversible	Changes in the employment workforce will be reversible following the completion of the construction phase.

Operation and Maintenance

During the operation and maintenance phase, the anticipated direct labour requirement for the Project is 12 FTE of staff annually over the 25 year duration of operation and maintenance (**Table 11-12**). The majority of this labour will be direct employment by OTW LP, but there will be some need for contracted services to support activities, such as environmental monitoring.

As with the construction phase, OTW LP is committed to maximizing the workforce sourced from the LAA and RAA to provide long-term economic benefits for the region through the operational life of the Project. Specifically, the Project may present employment opportunities for local candidates with experience in power generation prior to or following the anticipated closure of the Poplar River power generating station. However, some positions will require specialized training and workforce that may require being sourced outside the LAA and RAA. The residual effects of the Project on the local and regional workforce during operation and maintenance are characterized in **Table 11-14**.

Table 11-14: Characterization of Residual Effects on Local and Regional Workforce during Project Construction

Criterion	Measure	Description
Direction	Positive	There will be an increase in employment opportunities
Magnitude	Moderate	The workforce change during Project operation and maintenance will have a moderate magnitude relative to the overall workforce of the area.
Geographical Extent	LAA	Effects on the labour force will be observed largely within the LAA during the operation and maintenance phase.
Duration	Medium-term	Effects of Project construction on the workforce will last through the operation and maintenance phase of the Project, which will be a duration of at least 25 years.
Frequency	Continuous	Effects of Project operation and maintenance on the workforce will be a continuous event that will last through the entire phase.
Reversibility	Reversible	Changes in the employment workforce will be reversible following the completion of the construction phase.

Decommissioning

The anticipated employment through labour and services during the decommissioning phase are less predictable, as advances in technology and decommissioning standards may affect the true labour required. However, it is anticipated that the labour and services required for decommissioning will be similar to the construction phase, and therefore will be characterized in a similar manner to **Table 11-13**.

11.4.3 Change in Economy

11.4.3.1 Effect Pathways

The effect pathways of the Project that can cause a change in the economy are similar for the construction, operation and maintenance, and decommissioning phases, though they will vary in magnitude among them. These effect pathways are as follows:

- Direct and indirect employment by the Project through all three phases will result in increases in tax revenue for provincial and federal governments, and may result in increased municipal taxes through residential construction and upgrades;
- Purchases of goods and services directly by the Project will result in an increase in economic activity at various geographic scales;
- The indirect purchase of goods and services through employment from the Project will result in increase in economic activity at various geographic scales; and
- Direct ownership of the Project by local Indigenous groups will provide economic benefits to Saskatchewan First Nations.

11.4.3.2 Mitigation Measures

As effect pathways of the Project on the economy are all anticipated to be positive in direction; therefore, no mitigation measures were identified to reduce or avoid adverse residual effects. As indicated in **Section 11.4.2.2**, OTW LP has developed a detailed value-added community benefit plan (**Appendix K.1**) and a community engagement plan (**Appendix K.2**) that will assist in guiding the successful implementation of economic benefits to the local and regional communities.

11.4.3.3 Predicted Residual Effects

Construction

The phase of the Project with greatest capital expenditures on goods and services will be during the construction phase. This phase is anticipated to require the purchase of approximately $300 Million in goods and services, that will be sourced both locally, regionally, and outside of the RAA. OTW LP is committed to sourcing local goods and services wherever possible and economically feasible; however, some goods and services will be highly specialized and may require being sourced outside the RAA. The construction phase will have both direct and indirect positive effects through local and regional economic benefits. In addition to the direct economic benefits of the Project during construction, there will be value-added economic benefits from the Project that are outlined in **Appendix K.1**.

In addition to the benefits outlined above, the direct ownership of 49% of the Project through a partnership with FHQ, NuWind, and eleven First Nations will provide economic benefits directly to Saskatchewan First Nations that will be partners in this Project. The residual effects of the Project on the economy during construction are characterized in **Table 11-15.**

Table 11-15: Characterization of Residual Effects on the Economy during Project Construction

Criterion	Measure	Description
Direction	Positive	There will be an increase in economic activity as a result of Project construction
Magnitude	Moderate	The change in economy during Project operation and maintenance will have a moderate magnitude relative to the economy in the LAA.
Geographical Extent	LAA/RAA	Effects on the economy will be observed largely within the LAA during the construction phase, but will extend to the RAA and beyond through tax revenue increases.
Duration	Medium-term	Effects of Project construction on the economy will last through the construction phase of the Project and will provide benefits that will last beyond this phase
Frequency	Multiple Regular Events	Effects of Project construction on the economy will be multiple regular events through purchasing of goods and services
Reversibility	Reversible	Changes in the economy will be reversible following the completion of the construction phase.

Operation and Maintenance

During the operation and maintenance phase, the greatest effect of the Project on the economy will come through contributions of tax revenue at the municipal, province and federal levels. The Project is expected to increase the municipal tax revenue by 26% and 286%, respectively, for the RMs of Hart Butte and Happy Valley. The Project is anticipated to contribute approximately $1.4 Million annually in municipal and education tax revenue. Additional provincial and federal tax revenue from OTW LP will be generated, and will depend on the corporate tax rates of the Project and its economic performance.

The value-added community benefit plan (**Appendix K.1**) has identified several initiatives that will benefit the local economy directly and indirectly. For example, providing the opportunity to use Project infrastructure to improve the availability of internet services may stimulate economic activity through remote work arrangements and stimulate small business development in the LAA. The residual effects of the Project on the economy during operation and maintenance are characterized in **Table 11-16.**

Table 11-16: Characterization of Residual Effects on the Economy during Project Operation and Maintenance

Criterion	Measure	Description
Direction	Positive	There will be an increase in the economy during operation and maintenance as a result of the Project
Magnitude	Moderate	The economic change during Project operation and maintenance will have a moderate magnitude relative to the overall economy of the area.
Geographical Extent	LAA/RAA	Effects on the Project on the economy during operation and maintenance will be most measurable at the LAA scale, though effects will extent into the RAA and beyond.
Duration	Medium-term	Effects of Project on the economy will last through the entire duration of operation and maintenance, and may extend beyond.
Frequency	Continuous event	Effects of Project operation and maintenance on the economy will be a continuous event that will last through the entire phase.
Reversibility	Reversible	Changes in the employment workforce will be reversible following the completion of the construction phase.

Decommissioning

During decommissioning, the economic benefits from the Project will be similar to those during construction, but are anticipated to occur over a shorter duration of time (6 months) compared to the construction phase (1.5 years).

11.5 Assessment of Cumulative Environmental Effects on Employment and Economy

As described in **Section 11.4**, the Project is anticipated to have positive short and long-term effects on employment and the economy. As such, no adverse effects were carried forward for an assessment of cumulative environmental effects on this valued component.

11.6 Determination of Significance

11.6.1 Significance of Project Residual Effects

Overall, the predicted residual effects on employment and the economy as a result of the Project are anticipated to be positive in direction, moderate in magnitude, variable in extent from the LAA to RAA and beyond, short-term to medium-term in duration, and occur as single or continuous events. No specific mitigation measured were identified to reduce or avoid effects on employment and the economy, though consultation and engagement will improve the overall benefits of the Project. As the proposed Project is a partnership that includes eleven First Nations of Saskatchewan, there will be measurable economic benefits to local First Nations. As the effects are anticipated to be positive, no significance determination was made.

11.6.2 Significance of Cumulative Effects

No cumulative effects of the Project on employment and the economy were assessed (see **Section 11.5**). As such, there is no determination of significance of cumulative effects.

11.7 Prediction of Confidence

The prediction confidence of the effects of the Project on employment and economy are considered to be moderate to high. This is based on the known costs and labour requirements of the Project, as well as the known employment and economic activities in the area. Uncertainty exists in the specific labour force available in the LAA and RAA, which may require sourcing labour, goods and services outside the RAA.

11.8 Follow-Up and Monitoring

There are no follow-up and monitoring programs proposed for the employment and economy that will be undertaken specifically by OTW LP. Monitoring and assessment programs undertaken through provincial and federal census programs and employment statistics will monitor the status of this valued component in the region.

12.0 Assessment of Potential Effects on Community Services and Infrastructure

12.1 Scope of Assessment

The VEC of community services and infrastructure was included in this EIS because the Project, through its activities, has the potential to affect local infrastructure, such as roads, and place increasing demands on community service, such as health services. The scope of the Project's potential effects on this VEC is described in this section.

12.1.1 Regulatory and Policy Setting

The community services and infrastructure VEC encompasses multiple services and pieces of infrastructure that are both publicly and privately owned. These are regulated under different pieces of legislation, of which relevant legislation is provided below.

12.1.1.1 Federal Legislation

Canada Health Act

The *Canada Health Act* is designed to ensure that all residents of Canada have reasonable access to medically-necessary hospital and physical services provided by provincial health programs. Residents of one province have their health needs covered in other provinces, should they require medical attention while in another province. This is relevant to the potential need of medical assistance by out of province labour completing the Project.

12.1.1.2 Provincial Legislation

The Public Health Act, 1994

In Saskatchewan, The *Public Health Act*, 1994, is the provincial legislation that defines the health services that are provided to residents of Saskatchewan, as well as sets out the services that are assigned to local authorities, and the payment of services.

The Municipalities Act, 2005

In Saskatchewan, municipalities are given authority and responsibility to maintain municipal infrastructure and roads within their jurisdictions. As such, any road that is not designated a federal highway or provincial road or highway would fall under the authority of the municipality to bear the cost of maintenance and construction.

12.1.2 Consideration of Issues Raised During Engagement

No concerns related to the potential effects of the Project on community services and infrastructure were raised during OTW LP's engagement with stakeholders, regulators, landowners and Indigenous communities.

12.1.3 Potential Effects, Pathways and Measureable Parameters

The potential effects, their pathways and measurable parameters of the Project activities on community services and infrastructure are presented in **Table 12-1**. The primary effects evaluated relate to potential effects on local transportation infrastructure due to heavy equipment traveling on municipal and provincial roads, and on the potential services required for temporary staff during more intensive phases, such as construction.

Table 12-1: Project Potential Effects, Effect Pathways and Measurable Parameters on Community Services and Infrastructure

Potential Effect	Effect Pathway	Measurable Parameters
Change in community services and infrastructure	An increase in the workforce within the Project area could increase the demand for essential services, such as food and lodging	• Population and workforce • Availability of temporary lodging • Food vendors available
	During Project activities, there may be unexpected events and accidents, including vehicle collisions, that would require additional health and policing services in the area	• Proximity and capacity of local health services • Proximity and capacity of law enforcement
	Project activities may increase the volume of traffic within the Project area, particularly during construction and decommissioning. This increased traffic, including the use of heavy equipment, may have effects on local infrastructure.	• Transportation network and capacity • Change in traffic volume and pattern

12.1.4 Boundaries

12.1.4.1 Spatial Boundaries

The spatial boundaries used to assess the potential effects of the Project on community services and infrastructure are presented in **Table 12-2**.

Table 12-2: Spatial Boundaries for the Community Services and Infrastructure Effects Assessment

Spatial Boundary	Boundary Description
Project Development Area (PDA)	Includes the Project footprint, which is the anticipated maximum area of physical disturbance associated with the construction and operation phases of the Project. The PDA includes the temporary (i.e., during construction) and permanent areas of physical disturbance.
Local Assessment Area (LAA)	The LAA is defined as the boundaries of the Rural Municipalities (RMs) that overlap the PDA. These include the RMs of Happy Valley and Hart Butte, where community services and infrastructure effects are anticipated to be most pronounced and measurable. The Town of Bengough is included in the LAA due to its proximity and services provided.
Regional Assessment Area (RAA)	The RAA includes the LAA and the nearby Cities of Weyburn, Regina and Moose Jaw as this is the extent to which some of the services would be provided.

The community services and infrastructure spatial boundaries are presented in **Figure 12-1.**

12.1.4.2 Temporal Boundaries

Temporal boundaries for community services and infrastructure are based on the three phases of the Project when activities are anticipated to be relatively consistent. Temporal boundaries are summarized in **Table 12-3** below:

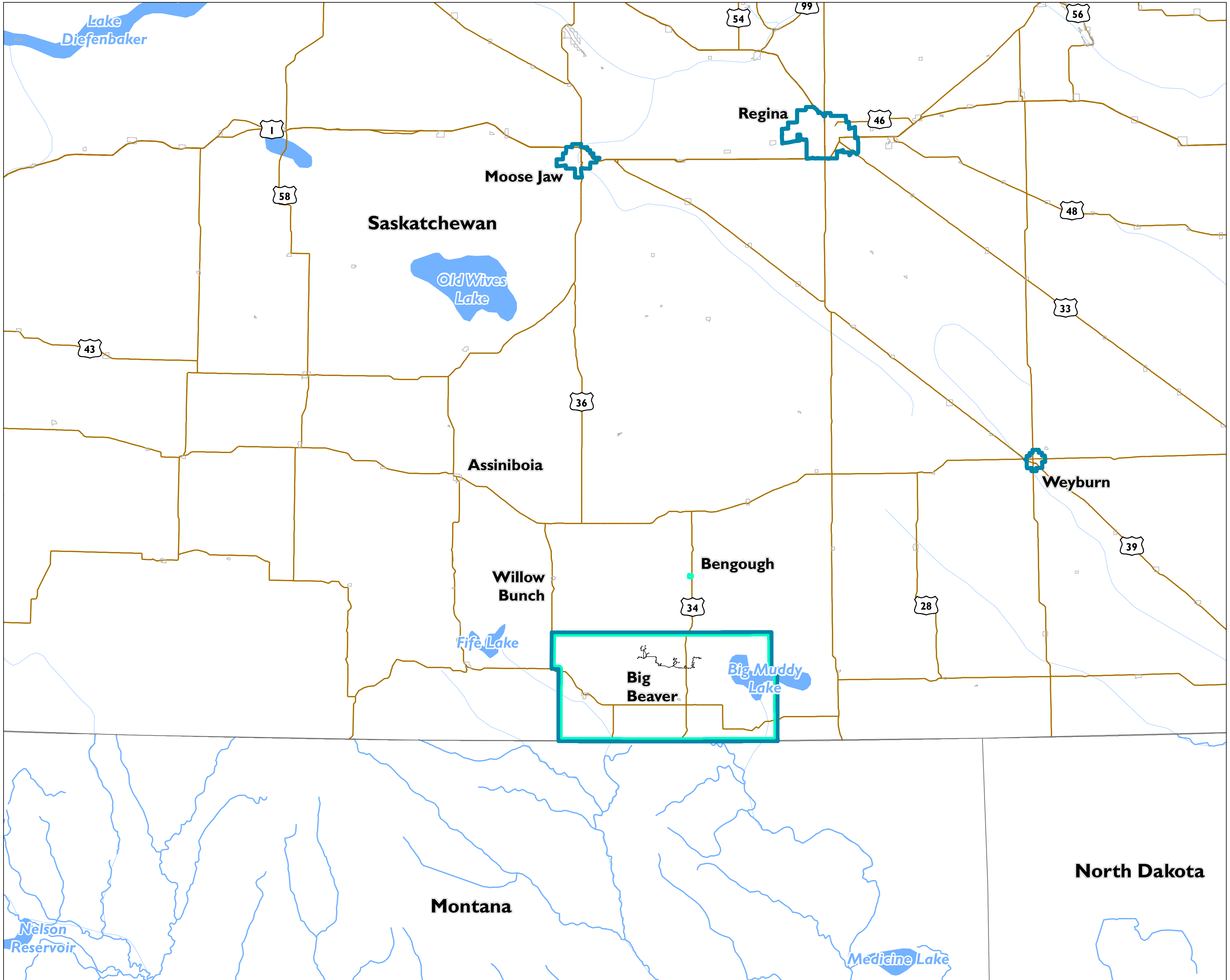
Table 12-3: Temporal Boundaries for the Community Services and Infrastructure Effects Assessment

Project Phase	Description
Construc on	The anticipated duration of the construction phase is approximately 1.5 years, which includes site preparation, construction of the Project components (e.g., WTGs, access roads, collector lines, substation, operation and maintenance building), reclamation of temporary workspaces, and Project commissioning.
Opera ons and Maintenance	The operation and maintenance phase will commence once the Project is commissioned, and is anticipated to continue for a minimum of 25 years before potential refurbishment or decommissioning may be required.
Decommissioning	The decommissioning phase is anticipated to last approximately six months, which will include the removal of above-ground infrastructure, portions of the concrete foundations, access roads and WTG pads, abandonment of buried collector lines, and reclamation of lands within the PDA to a condition similar to pre-development conditions, and appropriate for the future land use objectives, based on consultation with the landowners and regulatory requirements at that time.

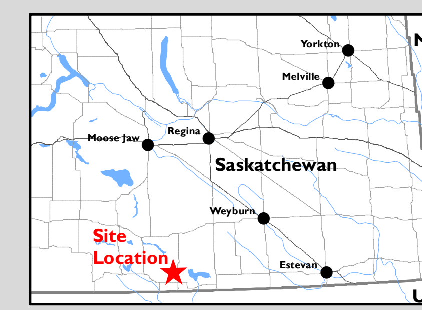
Employment and activity levels are expected to be higher during the construction and decommissioning phases of the Project resulting in greater potential effects on community services and infrastructure.

OUTLAW TRAIL WIND LP
OUTLAW TRAIL WIND ENERGY PROJECT

FIGURE 12-1
COMMUNITY SERVICES AND INFRASTRUCTURE ASSESSMENT AREAS



- Project Development Area
- Community Services and Infrastructure Local Assessment Area
- Community Services and Infrastructure Regional Assessment Area
- Urban Municipality
- Provinicial and State Boundaries
- Major Roads



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MAP DRAWING INFORMATION:

DATA PROVIDED BY CANVEC, ESRI, GEOSASK & DILLON CONSULTING

MAP CREATED BY PH
MAP CHECKED BY CD

MAP PROJECTION: NAD 1983 UTM Zone 13N ROTATION: -0.25°

PROJECT: 191825
STATUS: FINAL
DATE: 2021-03-01

FILE LOCATION: G:\GIS\2019\191825 - Outlaw Trail Energy Project\Product\Client\EIS\Figure 12_1 Community Services and Infrastructure Assessment Areas.mxd

12.1.5 Residual Effects Characterization

The potential effects of the Project on community services and infrastructure will be characterized using the criteria and qualitative measures provided in **Table 12-4**: Characterization of Residual Effects Evaluation Criteria for Community Services and Infrastructure.

Table 12-4: Characterization of Residual Effects Evaluation Criteria for Community Services and Infrastructure

Characterization	Description	Quantitative Measures or Definition of Qualitative Categories
Direction	The long-term trend of the residual effect on community services and infrastructure	**Positive:** effects that move parameters in a positive direction compared to baseline conditions. **Adverse:** effects that move parameters in a negative direction compared to baseline conditions. **Neutral:** no change in parameters for community services and infrastructure
Magnitude	The amount of change in measurable parameters of community services and infrastructure in comparison to existing conditions	**Negligible:** no measurable change in community services and infrastructure parameters. **Low:** Project effects are within the range of viability, unlikely to be detected. **Moderate:** Project effects are at a modest level, and detectable. **High:** confirmed effects on community services and infrastructure.
Geographic Extent	The geographic area in which residual effects may occur on community services and infrastructure	**PDA:** effects occur only in the PDA. **LAA:** effects occur in the PDA and the LAA. **RAA:** effects occur in the PDA, LAA and RAA.
Duration	The period of time required until the measurable parameters of community services and infrastructure return to existing conditions, or the effect can no longer be measured	**Short-term:** effects occur only during the activity. **Medium-term:** effects extend from construction and up to 10 years into maintenance and operation; effects extend throughout maintenance and operation. **Long-term:** effects extend through all phases of the Project and closure. **Permanent:** effects extend after closure of the Project and are unlikely to recover.
Frequency	When the effect occurs, how often during the life of the Project and in which phase(s) of the Project	**Single event:** event occurs once. **Multiple irregular events:** event occurs sporadically and/or intermittently. **Multiple regular events:** event occurs repeatedly and/or regularly. **Continuous:** event occurs continuously**.**

Characterization	Description	Quantitative Measures or Definition of Qualitative Categories
Reversibility	whether a measureable parameter can return to existing condition at the end of the Project	**Reversible:** effect expected to return to baseline conditions with activity completion and reclamation. **Irreversible:** effect unlikely to return to baseline conditions.

12.1.6 Significance Definition

Project effects on community services and infrastructure will be considered significant when they are predicted to cause a long-term adverse effect on services or infrastructure that could not be mitigated through anticipated programs, best management practices, or policies.

12.2 Existing Conditions for Community Services and Infrastructure

12.2.1 Methods

Baseline information was gathered through two key methods: desktop information gathering and consultation and engagement programs with various stakeholders, including municipal governments.

Desktop data sources included:

- Available information sources from business directories for the hospitality industry (hotels and restaurants); and
- Government directories (i.e., regional health authorities) of health facilities and emergency responders

Consultation and engagement carried out by OTW LP assisted in determining local infrastructure and potential facilities within the Project area.

12.2.2 Results

12.2.2.1 Community Services

The Hamlet of Big Beaver is the nearest community to the Project and is a small hamlet with few residents or services. There is one general store, Aust's General Store, which provides general supplies and groceries. There is a community campground that could accommodate construction crew members, if they had their own mobile accommodations. There are no other facilities in this hamlet.

The Town of Coronach, located approximately 20 km west of the Project along Highway 18, has a full suite of services. The Southland Co-op food store provides grocery supplies to the town and local area. There are five restaurants in the town, including: R.C. Chinese restaurant, Deb's Country Kitchen, the Nook Coffeehouse, Rustic Tavern, and the Country Boy Hotel. The total capacity of these restaurants is estimated to be 120-130 individuals. Accommodations within the Town of Coronach include the Coronach Hotel, the Country Boy Hotel, and the Coronach Poolside Campground where RV camping is provided. There is also a Canada Post office, as well as a convenience store, the Co-op gas bar, and a cardlock fuel service. There is a Royal Canadian Mounted Police (RCMP) detachment in Coronach, which provides services in English. The nearest bilingual RCMP detachment is located in the Town of Gravelbourg, approximately 175 km west of the Project.

The Town of Bengough is located approximately 22 km north of the Project along Highway 34. The town has a health services center, which functions primarily as a long-term care facility, but has some primary health staff in the case of emergency. There is also an RCMP detachment in Bengough, which is part of the Coronach detachment. There is a Co-op grocery store, as well as food services at the Bengough Café and Big Muddy Inn, that can accommodate approximately 30-40 individuals. Accommodations in Bengough include the Big Muddy Inn and the Bengough and District Regional Park where RV camping is provided.

12.2.2.2 Health and Emergency Services

Health services throughout the Province of Saskatchewan are supported through several province-wide programs. This includes Telehealth, which can provide health information and guidance over the phone and direct patients to specialized services. Rural portions of the Province are also supported by the Stars Air Ambulance service, to provide rapid emergency medical transportation to acute care facilities.

The Project is located in the Sun Country Health Region. The nearest emergency service provider to the Project is the Coronach Health Center. This center provides Ambulance and Emergency Medical Services, and is supported by specialized emergency services at other facilities, such as the hospitals in Regina. The Coronach Health Center also provides primary health care, rehabilitation services, home care, mental health services, palliative care, and dietitian services. Other services offered are not included as they would not be relevant to the potential services required for the workforce of the Project. The health center has twelve long-term care beds and three multi-purpose beds.

Outside the LAA, health services in the RAA are supported by facilities within the Cities of Weyburn, Regina, and Moose Jaw. Amongst these communities, a range of health and emergency services are available through a variety of facilities, including five hospitals and 53 health clinics.

12.2.2.3 Transportation

One primary highway, three all-season gravel collector roads and ten seasonal resource roads intersect with the PDA. The Project is expected to be primarily accessed via Highway 34, which is a two-land paved minor arterial highway that extends in a north-south direction across the PDA. Currently, the primary use of the all-season gravel collector roads within the PDA is expected to be associated with the rural residences in the region.

12.3 Project Interactions with Community Services and Infrastructure

The assessment of potential effects on community services and infrastructure focuses on changes in the community service capacity and local infrastructure as a result of Project activities. All Project activities identified will require services, such as food and accommodations, and may results in effects to local infrastructure, which will result in potential effects to this valued component. The effect pathways and parameters by which changes to community services and infrastructure can be measured are provided below in **Table 12-5**.

Table 12-5: Summary of Project Interactions with Community Services and Infrastructure

Project Activities	Potential Environmental Effects
	Change in Community Services and Infrastructure
Construction Phase	
Site preparation, including vegetation clearing, topsoil stripping, grading and development of WTG locations, MET tower locations, access roads, substation and temporary workspaces	✓
Installation of WTG and MET tower foundations; erection of WTGs and MET towers	✓
Installation of collector lines and substation infrastructure	✓
Post-construction reclamation of temporary workspaces	✓
Operation and Maintenance Phase	
Operation and use of WTGs, MET towers, substation and access roads	✓
Routine and unplanned maintenance of WTGs and substation infrastructure	✓
Routine and unplanned maintenance of collector lines, substation infrastructure and access roads	✓
Decommissioning Phase	
Dismantling and removal or Project infrastructure, including WTGs, collector lines, substation infrastructure and access roads	✓
Site reclamation	✓

12.4 Assessment of Residual Environmental Effects on Community Services and Infrastructure

12.4.1 Analytical Assessment Techniques

The analysis of potential effects of the Project on community services and infrastructure involves a qualitative evaluation of the Project activities in relation to the available services and infrastructure within the spatial areas of evaluation. It is based on assumptions related to the Project needs during each phase of the Project, and the approaches to servicing the labour and workforce during each phase, as well as considering mitigation for potential effects. Uncertainties in these assumptions are addressed through a conservative approach to the assessment. For example, housing of the labour during each phase would assume the need to obtain local accommodations, whereas it may be possible that temporary construction camps could be established during periods when peak construction activities may occur.

The assessment is based on the available information about:

- Services available within the Local Assessment Area;
- The relative change in service demand based on current population within the LAA;
- An understanding of approaches used for other similar projects; and
- Mitigation and commitments outlined by OTW LP as a result of consultation and engagement with RMs.

12.4.2 Change in Community Services and Infrastructure

12.4.2.1 Effect Pathways

During the peak of construction, the anticipated workforce will be approximately 132 FTEs (see **Section 11.4**), though this is not likely to result in 132 individual staff occurring on site at any given time. The specific labour force required will depend on the activities occurring at that time. Nonetheless, assuming 132 staff are required on the site, the highest demand on community services in the area would have an effect of occupying more than the available accommodations of the LAA in the absence of measures to address this. As the workers employed during the construction phase are a combination of local labourers and temporary specialized labour, personnel involved in the construction phase are not expected to cause demand on the local housing market. During the operation phase, the anticipated employment of 12 FTEs, which are anticipated to either currently live in the LAA, if hired locally, or seek permanent residence in the area (with the exception of employees based in OTW LP's Project headquarters in Calgary). Decommissioning would have similar effects to the construction phase, in the absence of mitigation.

During all three phases of the Project personnel are anticipated to cause an increase in demand on food services and retail grocery stores. This increased demand would likely be partially exerted on the Aust's store in Big Beaver, and equally between Coronach and Bengough, given their near equal distance to the Project. With a temporary construction camp and similar facility during decommissioning, there would likely be greater demand on retail groceries compared to dining establishments.

There is the potential for need of emergency services as a result of the Project. While minor injuries resulting from workplace or offsite accidents could create a demand for local services based in Coronach or Bengough, major accidents would likely require support from emergency medical services outside the LAA.

Potential effects to local infrastructure may result from the use of large, heavy transport vehicles to bring equipment and Project components to the site. Construction activities may also result in damage to local roads, and their water conveyance structures (i.e., culverts and bridges). Transportation and construction may also result in traffic alteration as the large transport vehicles require temporary road closures and traffic redirection.

12.4.2.2 Mitigation

Wind energy project construction and operation is now a well-established industry with many projects having been successfully constructed in rural areas of Saskatchewan, and other provinces. The primary approach to mitigating demand on available community services and infrastructure is through planning in advance. Specifically, the following recommended mitigation measures should be considered and applied, where necessary:

- Employ contractors that have experience completing wind energy projects in remote rural locations, and can accommodate their staff with temporary work camps to alleviate excessive demand on local accommodations. Where required, encourage contractors to consider personal mobile accommodations (i.e., trailers or RVs) at the regional parks or campgrounds.
- Communicate in advance with local vendors to allow advanced planning to supply food and for dining establishments to prepare for increased demand on services.
- Coordinate with emergency services (RCMP and Sun Country Health Authority) to develop an emergency response measures and services to the Project.
- Should the COVID-19 pandemic be ongoing at the time that construction begins, a pandemic practices plan should be established to reduce the risk of crew members becoming infected or transmitting communicable diseases to residents of the Project area.
- Develop a Project-specific emergency response plan (ERP) that can be implemented by the Project team in the event of an emergency, including having personnel on site that are trained in emergency response and have the proper equipment on site to address basic first aid and medical needs.
- As required under Provincial Health and Safety legislation, a worker/management occupational health committee that will be responsible for reviewing activities and health and safety concerns and management practices.
- Use skilled and trained contractors to complete activities of the Project will reduce or avoid effects to local infrastructure, and reduce health and safety risks.
- Establish a construction safety program specific to the site and conditions.
- Consider contracting an onsite paramedic during construction, when the workforce is greatest and there is a greater potential demand for onsite medical services.
- Develop a communication schedule and plan with the RMs to address road conditions, maintenance and transportation needs.
- Communicate in advance with local residents in the LAA about traffic restrictions and construction activities to limit disturbance to traffic in the Project area.

- Communicate transportation schedules and road crossings measures with municipal and provincial authorities.

These mitigation measures will apply throughout the construction, operation and maintenance, and decommissioning phases.

12.4.2.3 Predicted Residual Effects

Construction

The construction phase will have the greatest for potential effects on community services and infrastructure, as this is the phase with the greatest labour force and amount of physical works anticipated. There may be the need for some individuals to seek temporary accommodations at local hotels, which will provide economic benefits to the area; however, the majority of long-term construction personnel are anticipated to be housed in a temporary work camp. Considering the recommended mitigation and standard practice of establishing construction camps that provide temporary residences to construction crews. The anticipated effects on the local accommodation businesses in the LAA is predicted to be negligible.

Food services and retailers in the area have the capacity to service a workforce this size, between the dining establishments located in Bengough and Coronach. Additionally, the grocery retailers in Big Beaver, Bengough, and Coronach would be able to accommodate this level of workforce (approximately 132 FTEs), given that it represents only a 10% increase in the populations of Bengough, Coronach and the RMs of Happy Valley and Hart Butte combined (approximately 1,368 individuals; Statistics Canada 2017), if all personnel were brought in from outside the LAA. Communication and engagement with the local communities ahead of Project construction start will provide useful mitigation to allow this service sector to prepare in advance of an increase in business. As such, additional temporary workers will likely result in a net positive effect for this sector through increased business opportunities.

With exception of critical emergency situations requiring specialized support found in Regina and supported by the Stars Air Ambulance, health services in the area, including the two RCMP offices and emergency health services in Coronach, will be able to accommodate this level of temporary population increase to the area during construction and decommissioning. During operation, the additional staff employed for the Project would be offset by decreases in staff anticipated from the Poplar River Mine and Generating Station's impending closure. As with the food services sector, the low temporary population increase in relation to the population of the LAA is not anticipated to result in a measurable increase in the demands on the emergency services of the LAA. This assessment is also based on the implementation of Project-related health and safety measures, including an ERP, and best management practices. Given the anticipated timing of the start of construction of this project, health and safety risks related to the current COVID-19 pandemic is anticipated to be negligible based on predictions of pandemic response and recovery.

The primary transportation corridor to the Project is Highway 34, which passes through the Project area. The temporary laydown area for all equipment is anticipated to be located directly adjacent to Highway 34, which would provide direct access to heavy equipment and storage of materials. This highway has the capacity to accommodate larger transportation equipment required to bring Project components to the site. From the laydown area, transportation will follow a network of municipal gravel roads, which will require upgrading in some areas to accommodate the transportation of equipment and components. Any upgrading completed would benefit the local community with road improvements. The Project is likely to cause some temporary disruption to traffic during the construction phase when equipment and components of the Project are transported to site. This will be mitigated through a traffic management plan and coordination with municipalities, the Ministry of Transportation, and RCMP. Other potential effects to local infrastructure, such as road quality, will be addressed through agreements with the municipalities on road maintenance and upgrades to accommodate the equipment used during construction.

Overall, considering mitigation available to reduce or avoid potential effects of the Project on community services and local infrastructure, the Project is predicted to have a low or negligible effects, which may trend towards positive or adverse direction. The predicted effects are characterized in **Table 12-6**.

Table 12-6: Characterization of Residual Effects on Community Services and Local Infrastructure during Project Construction

Criterion	Measure	Description
Direction	Positive/Adverse	Demand on some community services and effects on local infrastructure are predicted to have positive or adverse effects, depending on the specific service or infrastructure.
Magnitude	Negligible/Low	Many of the predicted effects to community services and infrastructure are predicted to be negligible or low considering mitigation, and the low degree of change in population in the LAA as a result of construction activities.
Geographical Extent	LAA	Effects on the Project on community services and infrastructure during construction will be most measurable at the LAA scale where services are offered and infrastructure will be used.
Duration	Short-term	Effects of Project on the community services and infrastructure during construction will not extent beyond the construction phase.
Frequency	Continuous event	Project effects on community services and infrastructure during construction would be continuous during this phase.
Reversibility	Reversible	Project effects on community services and infrastructure during construction would be will be reversible following the completion of the construction phase.

Operation and Maintenance

As the labour force during the operation and maintenance phase is expected to be approximately 12 FTE (0.9% change in the population of the LAA), this will have a negligible effect on the local housing market, particularly given the low demand for housing and high volume of listings in the area currently. An increase in employment opportunities will provide a small positive effect in the area, given the impending closure of the Poplar River Coal Mine and Generating Station.

The predicted effects to the food services sector are also anticipated to be negligible, but in a positive direction, as this will increase business demand in an area where the population is predicted to decline. Effects on the emergency medical services are also anticipated to be negligible, given the very small potential increase in population and the available services in the area.

The potential effects to local infrastructure during the operation and maintenance phase is anticipated to be negligible. This is because there will be minimal equipment used during this phase, and it will primarily consist of small light or medium commercial vehicles to provide service and maintenance to the turbines. These vehicles are anticipated to be similar to farm equipment used on a regular basis in the area.

Considering the low change in demand for services as a result of the small increase in workforce during operation and maintenance, and the mitigation measures available, the predicted Project effects during this phase are going to be negligible. The residual effect characterization for this phase is provided in **Table 12-7**.

Table 12-7: Characterization of Residual Effects on Community Services and Local Infrastructure during Operation Phase

Criterion	Measure	Description
Direction	Positive/Neutral	Demand on some community services and effects on local infrastructure are predicted to have positive or neutral effects, depending on the specific service or infrastructure.
Magnitude	Negligible	Many of the predicted effects to community services and infrastructure are predicted to be negligible or low considering mitigation, and the low degree of change in population in the LAA as a result of construction activities.
Geographical Extent	LAA	Effects on the Project on community services and infrastructure during construction will be most measurable at the LAA scale where services are offered and infrastructure will be used.
Duration	Medium-term	Effects of Project on the community services and infrastructure during construction will not extent beyond the construction phase.
Frequency	Continuous event	Project effects on community services and infrastructure during construction would be continuous during this phase.

Criterion	Measure	Description
Reversibility	Reversible	Project effects on community services and infrastructure during construction would be will be reversible following the completion of the construction phase.

Decommissioning

The effect to community services and infrastructure during the decommissioning phase are predicted to be similar to the construction phase with the exception that decommissioning is anticipated to occur over a shorter period of time. Note that because decommissioning is not anticipated for at least 25 years after commissioning, there may be meaningful changes in community services and infrastructure within the LAA at that time and a re-assessment of the potential effects to community services and infrastructure should be completed at that time. For a characterization of residual Project effect on community services and infrastructure, see **Table 12-6**.

12.5 Assessment of Cumulative Environmental Effects on Community Services and Infrastructure

As described in **Section 12.4**, with the application of mitigation measures, the Project is anticipated to have largely negligible or low effects, that trend in either positive or adverse direction. As such, no adverse effects were carried forward for an assessment of cumulative environmental effects on this VEC.

12.6 Determination of Significance

12.6.1 Significance of Project Residual Effects

Overall, the predicted residual effects on community services and infrastructure as a result of the Project are anticipated to be positive or negative in direction, low or negligible in magnitude, at the extent from the LAA, short-term to medium-term in duration, and occur on a continuous basis. Several mitigation measured were identified to reduce or avoid effects on community services and local infrastructure, including consultation and engagement with several stakeholders. Therefore, based on the significance definition criteria provided in **Section 12.1.6**, there will be no significant effects of the Project on community services and infrastructure.

12.7 Prediction of Confidence

The prediction confidence of the effects of the Project on community services and infrastructure are considered to be moderate to high. Some uncertainty exists as to how the existing community services within the LAA and RAA may change between in time period between the information gathering and the onset of construction. However, given the relative small size of the workforce required during construction, coupled with the experience of OTW LP personnel in developing wind projects in rural landscapes, the potential effects of the Project on community services and infrastructure are expected to be manageable.

12.8 Follow-Up and Monitoring

As discussed in **Section 3.3.**7, OTW will develop a CLC prior to construction initiation. This committee will be comprised of community leaders, community members and Project representatives from the development, construction and operations teams and will be a key venue for the community to engage and discuss Project issues. Questions and concerns raised by community members will be documented and addressed by the appropriate Project personnel. All discussion points will be documented and tracked by OTW LP, with the intention of addressing all questions and concerns to the satisfaction of the interested parties.

Monitoring and assessment programs related to health and safety will be undertaken through reporting of work-related injuries to appropriate provincial authorities.

13.0 Effects of the Environment on the Project

13.1 Scope of Assessment

Effects of the environment on the Project refer to natural or anthropogenic events or forces that may affect the normal function or stability of Project-related activities or operations. The determination of the potential severity of these effects is based on the ability of the Project, as constructed, to withstand both normal and extreme environmental conditions that may be experienced at the site and within the vicinity. This can largely be accomplished through the implementation of a detailed and thorough planning process and engineering design.

13.1.1 Interactions of the Environment with the Project

The primary environmental factors included in the assessment to have possible consequences on the proposed Project include, but are not necessarily limited to, the following:

- Severe weather, including:
  - Extreme precipitation events;
  - Extreme temperatures;
  - Extreme wind speeds; and
  - Severe storm events; and
- Wildfires.

The frequency and severity of severe weather events and wildfires may be influenced by the effects of climate change. Climate change is an acknowledged change in climate that has been documented over two or more 30-year periods. According to the Intergovernmental Panel on Climate Change (IPCC), climate change may be a result of natural internal processes or external forces, or the persistent anthropogenic changes in the composition of the atmosphere or in land use (IPCC 2014). The United Nations Framework Convention on Climate Change (UNFCC) makes a distinction between climate change attributed to human activities and climate variability attributable to natural causes, by defining climate change as a change in climate directly or indirectly attributed to human activity that alters the composition of the global atmosphere, and which is in addition to natural climate variability observed over comparable time periods (IPCC 2014).

The effects of climate change were not assessed separately in the assessment of effects of the environment on the Project. Rather, the influence of climate change (based on climate data projections) on each of the above-mentioned environmental factors were considered in the assessment.

13.1.2 Boundaries

13.1.2.1 Spatial Boundaries

The assessment of effects of the environment on the Project was limited to the PDA, which represents the area directly disturbed by Project activities, including temporary and permanent works and physical activities associated with the Project.

13.1.2.2 Temporal Boundaries

The environment has the potential to affect the Project during the construction, operation and maintenance, and decommissioning phases (including post-decommissioning activities such as ongoing monitoring and reclamation). However, the assessment of potential effects of the environment focused on the construction, operation and maintenance phases of the Project. Potential effects of the environment during the decommissioning phase are anticipated to be similar to those during construction, although to a lesser degree due to the reduced work areas.

13.1.3 Significance Definition

An adverse effect of the environment on the Project is considered significant if it results in one or more of the following outcomes:

- Damage to Project infrastructure resulting in a substantial increase in risks to public health and safety;
- Damage to Project infrastructure resulting in extensive repairs that would not be considered economically or technically feasible to implement;
- A substantial change in the Project construction schedule (e.g., delays extending the construction schedule by one or more seasons); and
- A substantial change in Project operation such that energy generation targets cannot be met.

13.2 Assessment of Severe Weather on the Project

Extreme precipitation, air temperatures, storm events and wind speeds may adversely affect Project infrastructure or activities during the construction, operation and maintenance, and decommissioning phases. To assess its potential effects on the Project, severe weather includes heavy rainfall and snowfall events, extreme air temperatures (both high and low), extreme wind speeds and severe storm events (i.e., thunderstorms, blizzards, hail storms and tornadoes).

Saskatchewan has one of the most variable climates in the world (Prairie Adaptation Research Collaborative [PARC] 2010). Precipitation and temperatures range widely between geographic regions, and between seasons and years. Similarly, the frequency and severity of storm events vary seasonally, with more frequent and severe storms occurring in the winter. Representative baseline weather data for the Project are summarized in the sections below to describe the conditions that are typical for the location.

13.2.1 Existing Climate Conditions

A review of available meteorological data (i.e., climate normals for precipitation, temperature and wind speed from 1981-2010) available from ECCC (2020b) was conducted for the climate station located at the SaskPower Poplar River Power Station (Station ID: 40318MN; 756 m above sea level), located 19.5 km southwest of the PDA. The meteorological data pertaining to precipitation, air temperature, and wind speeds are provided below, and summarized in **Table 13-1.**

13.2.1.1 Precipitation

According to the data provided in the ECCC dataset for the climate station located at the SaskPower Poplar River Power Station, the Project region receives 339.3 mm of annual precipitation, on average. Monthly average precipitation varied throughout the monitoring period, with the lowest values generally corresponding to the winter months (a lowest mean of 8.6 mm in February) and higher precipitation in the late spring and early summer months (a highest mean of 73.5 mm in June). The maximum extreme daily rainfall event during the monitoring period was 64.6 mm, recorded on July 3, 1993, while the maximum extreme daily snowfall event was 23.0 cm, recorded on May 23, 2004 (see **Table 13-1**).

13.2.1.2 Temperature

Based on the ECCC (2020b) dataset, monthly average daily air temperatures from 1981 to 2010 ranged from -11.2°C in January to 19.1°C in July, with an annual average of 4.4°C. Average daily maximum temperatures range from -5.5°C (January) to 26.9°C (July), while average daily minimum temperatures range from -16.8°C (January) to 11.3°C (July). The maximum extreme temperature during the monitoring period was 42.1°C, recorded on July 24, 2007, while the minimum extreme temperature was -41.0°C, recorded on February 8, 1994 (see **Table 13-1**).

13.2.1.3 Wind Speed

During the monitoring period from 1981 to 2010, monthly average wind speeds ranged from 13.5 km/h in July to 17.8 km/h in May, with an average annual wind speed of 15.6 km/h. The maximum recorded hourly wind speed was 98 km/h, recorded on May 5, 1985. The most frequent wind direction from 1981 to 2010 was northwesterly (i.e., travelling toward the southeast) (see **Table 13-1**).

Table 13-1: Canadian Climate Normals Summary for the Project Region from 1981 to 2010

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average Rainfall (mm)	0.3	0.1	5.3	17.0	48.6	73.5	55.6	31.3	18.4	15.3	2.0	0.2	267.5
Average Snowfall (cm)	13.2	6.9	12.0	4.5	2.5	0.0	0.0	0.0	0.6	2.7	11.3	15.8	69.3
Average Precipitation (mm)	13.5	8.6	18.3	21.4	51.1	73.5	55.6	31.3	18.9	17.9	13.3	15.9	339.3
Extreme Daily Rainfall (mm)	2.0	0.6	12.0	20.6	33.2	44.1	**64.6**	40.0	31.2	19.0	5.4	6.0	-
Extreme Daily Snowfall (cm)	15.0	9.4	15.7	14.0	**23.0**	0.0	0.0	0.0	5.0	6.2	20.0	20.0	-
Average Daily Temperature (°C)	-11.2	-8.2	-2.4	5.1	11.2	16.0	19.1	18.4	12.1	5.2	-3.5	-9.6	4.4
Average Daily Maximum Temperature (°C)	-5.5	-2.6	3.3	12.3	18.4	22.9	26.9	26.6	19.9	12.1	2.2	-4.0	11.0
Average Daily Minimum Temperature (°C)	-16.8	-13.6	-8.0	-2.1	3.9	9.2	11.3	10.2	4.4	-1.9	-9.2	-15.1	-2.3
Extreme Maximum Temperature (°C)	15.0	19.0	24.0	31.5	36.0	40.0	**42.1**	38.0	35.8	34.0	24.5	13.7	-
Extreme Maximum Temperature (°C)	-40.0	**-41.0**	-35.3	-21.6	-11.9	-4.0	2.4	-1.5	-9.7	-22.0	-35.0	-40.0	-
Average Wind Speed (km/h)	15.7	15.4	16.0	16.8	17.8	16.3	13.5	13.9	15.2	15.6	14.9	15.4	15.6
Maximum Hourly Wind Speed (km/h)	85.0	69.0	76.0	87.0	98.0	87.0	61.0	61.0	57.0	82.0	70.0	76.0	-

Source: ECCC (2020b).

13.2.1.4 Severe Storm Events

In Saskatchewan, storm events most commonly occur in the southern portion of the province. Thunderstorms are typically short-lived events; however, they can result in a substantial amount of precipitation over a short period of time and are often accompanied by lightning, hail and occasionally tornadoes (PARC 2010).

Lightning typically accompanies summer thunderstorms when warm air mixes with cool air, which causes the atmosphere to become polarized; the resultant electrostatic electricity in the clouds is then discharged. Lightning also can be initiated in the presence of dust storms or tornadoes. From 1999 to 2018, a total of 32,112 cloud-ground- lightning flashes were recorded within 25 km of the City of Moose Jaw, with an annual average of 31.0 days of recorded lightning occurrence (ECCC 2019).

Hail is typically associated with intense thunderstorms. Hail is formed when rain is carried upward into the atmosphere, where it freezes and accumulates into ice particles varying in size from less than 0.5 cm and up to 10 cm in diameter, which then fall to the ground. In Saskatchewan, severe hail events are most often recorded in the south-central portion of the Province, with 62 severe hail events recorded in the Project region from 1978 to 2007 (PARC 2010).

Tornadoes are occasionally associated with severe storm events during the summer in Saskatchewan. Tornadoes form as a strong vortex that extends downward from a cloud, which results from the mixing of warm, humid air with cooler air masses from the north. Saskatchewan has one of the highest occurrences of tornadoes in Canada (PARC 2010); however, the vast majority of tornado events are weak (i.e., rated 0-1 on the EF-Scale [ECCC 2018]). Within the public forecast region in which the Project is located, 46 tornado occurrences were recorded between 1970 and 2009 (PARC 2010).

13.2.2 Potential Effects of Severe Weather on the Project

13.2.2.1 Extreme Precipitation Events

As discussed in **Section 13.2.1**, the majority of precipitation in the Project region occurs in the late spring and early summer months. Extreme precipitation events may cause severe runoff, resulting in flooding and erosion of roads and work areas within the PDA. Slopes may become eroded and undercut, which may, in turn, compromise slope stability and discharge sediment into local drainages. Runoff could also result in the transfer of contaminants (e.g., hydrocarbons) into local wetlands and drainages.

Extreme precipitation events could affect Project activities during the construction, operation and maintenance, and decommissioning phases by hindering vehicle and equipment travel along access roads and work areas, due to reduced traction or visibility. Access roads may become washed out or damaged from runoff or vehicle and equipment travel during or following extreme precipitation events, which may result in work interruptions causing schedule delays. In addition, during the winter seasons, high volumes of snowfall or ice buildup could increase loads on Project infrastructure (e.g., WTG blades and nacelle, Project buildings) which may result in structural damage.

Extreme precipitation events may also pose a safety risk to Project personnel, as a result of unsafe driving conditions or excessive loads on Project infrastructure. These safety risks may also result in work interruptions and delays to the construction, operation and maintenance, and decommissioning phases.

Based on climate change projections (IPCC 2014) average precipitation in mid-latitude North America is not projected to change substantially. However, extreme precipitation events are very likely to become more intense and frequent as global mean surface temperatures increase.

13.2.2.2 Extreme Temperatures

Air temperatures in the Project region are typical of a continental semi-arid climate, with hot summers and cold, dry winters. Extreme temperatures can affect Project personnel, equipment, infrastructure and buildings during the Project construction, operation and maintenance, and decommissioning phases.

Extreme low temperatures combined with wind chill can pose a health and safety risk to site personnel (i.e., risk of hypothermia or frostbite), while increased lubricant viscosity and increased heating requirements may result in a higher frequency of equipment malfunction, damage, and potential for spills. Also, additional heating requirements for buildings, vehicles, and machinery may increase the power demand for the Project.

Extreme high temperatures may also pose a health and safety risk, as personnel may be at higher risk to dehydration, heat exhaustion, and heat stroke while working in high temperatures over a prolonged duration. Extreme high temperatures can also increase the potential for wildfire occurrence (see **Section 13.3**). These potential effects on the Project may in turn result in interruption and delays during the construction, operation and maintenance, and decommissioning phases.

Across all emission scenarios assessed by the IPCC (2014), global surface temperatures are projected to rise over the 21st century. These projections indicate that it is very likely that extreme high temperature events will occur more frequently and persist for longer durations, while extreme cold events will occur less frequently overall. Within Saskatchewan, a similar trend of rising mean annual temperatures since 1895 has been documented through analyses of climate data in five communities across the province (Sauchyn *et al*. 2009). Recent temperature trends suggest that temperatures in Saskatchewan are becoming “less cold” rather than getting hotter, with larger increases in daily minimum temperatures (opposed to maximum), and the largest warming trends occurring during the winter and early spring. This warming trend is projected to correspond to an increase in the deficit between annual precipitation and potential water loss by evapotranspiration, which may in turn result in more frequent and persistent drought conditions in southern Saskatchewan (Sauchyn *et al*. 2009).

13.2.2.3 Extreme Wind Speeds

In the Project region, average wind speeds are highest in the spring, with both the highest average wind speed and extreme wind speed occurring in May (ECCC 2020b). Extreme winds may be associated with other extreme weather events including storms and tornados (PARC 2010). Extreme wind speeds can cause damage to equipment and buildings on-site during the construction, operation and maintenance, and decommissioning phases of the Project. Some Project activities (i.e., WTG construction, maintenance and dismantling) cannot be completed during periods of high wind speeds, which may lead to temporary delays in construction or interruptions to operation. Additionally, high wind speeds increase the potential for wind erosion of soils, which may result in soil loss and inhibited vegetation re-establishment following reclamation activities. However, extreme wind events, and any resulting potential effects on the Project, are expected to be short in duration.

13.2.2.4 Severe Storm Events

Severe storms, such as thunderstorms, blizzards, hailstorms and tornadoes, while typically short in duration, can be forceful events. These storms may affect the Project during construction, operation and maintenance, and decommissioning phases of the Project by causing brief delays and temporary interruptions in Project activities. Severe storms may also pose a safety risk to on-site Project personnel, particularly in regards to lightning strikes, damaging hail, and tornadoes. They may also cause damage to Project equipment, buildings and infrastructure.

As discussed in **Section 13.2.1.1**, climate change projections suggest that the frequency and intensity of extreme precipitation events, are very likely to increase over the 21st century (IPCC 2014). Currently extreme precipitation events often occur as severe storms, such as blizzards and thunderstorms (with which hail and tornadoes are typically associated). Therefore, it is reasonable to assume that the frequency and intensity of severe storm events will similarly increase.

13.2.3 Mitigation Measures for Severe Weather

The potential effects of severe weather on the Project can largely be mitigated during the development phase, by incorporating the potential incidence of extreme precipitation events, temperatures, wind speeds and storm events into the Project design, and implementation of design standards and operational guidelines.

The following mitigation measures will be implemented to address the potential effects of severe weather on the Project:

- Install WTGs that have been designed to withstand severe weather conditions, including extreme temperatures, extreme wind speeds and hail, and are equipped with ice detection systems.
- Design Project infrastructure with a sufficient safety factor to manage for extreme precipitation events that can be expected during the construction, operation and maintenance, and

decommissioning phases. Though the Project life is relatively short in comparison to the timeframes for expected climate change to occur, design should also consider future conditions that may be associated with climate change;

- Design the permanent access roads and work areas (i.e., WTG pads, MET tower pads and substation) such that the runoff expected during extreme precipitation events can be handled by a sufficiently sized drainage network;
- Develop and implement a weather monitoring program that will anticipate upcoming weather events, and allow for appropriate planning in response to extreme conditions;
- Schedule Project activities to coincide with appropriate seasonal and weather conditions (i.e., work near wetlands and drainages should be conducted during dry or frozen conditions);
- Implement regular inspection and site maintenance programs, so areas compromised by extreme precipitation events are promptly identified and repaired;
- Develop and implement an erosion and sediment control plan, with necessary materials and equipment available to quickly respond to flood events and manage effects related to erosion and sediment transfer in susceptible areas of the Project;
- Effectively communicate weather response protocols to all Project personnel;
- Construct all buildings and infrastructure to be compliant with appropriate standards, such as the National Building Code of Canada (National Research Council Canada, 2015);
- Workers will wear appropriate clothing suitable for the weather conditions, and will be trained in assessing risks related to extreme temperatures;
- Implement temporary shutdowns of Project activities during severe weather events, as required;
- Provide additional personal protective equipment to on-site personnel to manage the effects of extreme temperatures (e.g., insulated gloves suitable for low temperatures);
- Incorporate procedures to address extreme storm events into the Emergency Response Plan for the Project, such as evacuation plans in the event of a tornado;
- Equip Project infrastructure (i.e., WTGs, overhead collector lines, MET towers, substation infrastructure) with lightning protection, in accordance with building codes and industry standards; and

13.2.4 Characterization of Residual Effects of Severe Weather on the Project

Based on historical weather data, extreme weather events are not uncommon in the Project region. Also, climate projections indicate that the frequency and intensity of these events are likely to increase over the 21st century. Nonetheless, these events are typically short in duration and can often be pre-emptively identified in weather forecasts.

Through compliance with relevant building, WTG and design standards, implementation of the mitigation measures identified above and establishing effective health and safety policies throughout all phases of the Project, the potential effects of severe weather on the Project can be managed. Therefore, no residual effects of severe weather on the Project are expected.

13.3 Assessment of Wildfires on the Project

Wildfires have historically been a common occurrence on prairie landscapes in Saskatchewan. However, as land development has expanded across southern Saskatchewan for industries such as agriculture and oil and gas production, fire response practices have similarly expanded to quickly extinguish wildfires and prevent property damage.

The occurrence and severity of wildfires are affected by weather conditions. Periods of high temperatures, low precipitation and high wind speeds can increase the risk and intensity of wildfires. Within a prairie landscape, the most common causes of wildfires are lightning and human activities. The Project is located in a region dominated by the agriculture industry; activities associated with agriculture that may result in wildfires include equipment operation and burning crop residue. Also, Project activities such as hot work (i.e., welding, grinding and cutting) and equipment operation during the construction, operation and maintenance, and decommissioning phases.

As discussed in **Section 13.2**, climate projections suggest that average temperatures will continue to increase in Saskatchewan, with the largest warming trends occurring during the winter and early spring. This warming trend is anticipated to result in more frequent and persistent drought conditions in southern Saskatchewan (Sauchyn *et al*. 2009). Further, the occurrence and intensity of extreme precipitation events, including storm events associated with lightning, are predicted to similarly increase. These projected conditions may result in an increase in wildfire incidence in southern Saskatchewan.

13.3.1 Potential Effects of Wildfires on the Project

There is potential for wildfires to disrupt Project activities during the construction, operation and maintenance, and decommissioning phases. The primary potential effects of wildfires on the Project pertain to potential damage to Project infrastructure (e.g., wooden poles of overhead collector lines) and the potential risk to human health and safety. Smoke from wildfires may also obscure visibility, thereby presenting a hazard to vehicle traffic. Wildfires in the Project area may also result in work interruptions, delays to the Project construction schedule or reductions in power generating capacity during operation.

13.3.2 Mitigation Measures for Wildfires

The following mitigation measures will be implemented to address the potential effects of wildfires on the Project:

- Development of a site-specific Emergency Response Plan that includes fire prevention, monitoring, detection, notification and evacuation;
- Coordination of fire control efforts with local emergency response personnel (i.e., volunteer fire departments, RCMP and provincial fire management agencies);

- Maintenance of fire prevention and response equipment on-site at all times, including having fire extinguishers available throughout the PDA;
- Regular maintenance and replacement of fire extinguishers, as required;
- Ensure that all employees are trained in prevention, detection and response to fires;
- Prohibition of smoking except in designated areas that are set well back from Project infrastructure as well as potential sources of combustible materials (such as fuel storage areas);
- Implementation of fire bans during times of elevated fire risk;
- Adjusting work procedures to limit risk during times of elevated fire risk;
- Park off-road vehicles on gravel areas kept free of fire fuel;
- Establish designated refuelling areas where open flame is prohibited;
- Maintenance of all equipment in good condition; and
- Constructing buildings and infrastructure on-site to comply with Saskatchewan and federal fire codes.

13.3.3 Characterization of Residual Effects of Wildfires on the Project

Throughout the construction, operation and maintenance, and decommissioning phases, management plans and procedures will be established to reduce the potential for occurrence of fires within the PDA, and to respond appropriately to fires that occur outside of the PDA (i.e., wildfires). During onboarding, workers on-site will undergo training to become familiar with these management plans and procedures.

The potential effects of fires on the Project will be considered during the detailed engineering and design of the Project components, including buildings and hazardous materials storage areas (e.g., fuels), so that in the event that a fire occurs in proximity to the PDA, the potential for the fire to result in substantial damage to infrastructure will be reduced.

By implementing the above mitigation measures, following standard industry BMPs, and continually improving upon procedures through adaptive management, the likelihood of a wildfire occurring in close proximity to the Project is considered to be low. However, in the event of a fire occurrence, appropriate emergency response procedures would be in place to quickly control and extinguish the fire before coming into contact with Project components or posing a risk to human health and safety. Therefore, no residual effects of wildfires on the Project are anticipated.

13.4 Summary of Residual Effects of the Environment on the Project

Severe weather and wildfires have the potential to affect the Project and its associated infrastructure. This, in turn, could result in effects to the biophysical environment (i.e., native vegetation communities, wildlife and wildlife habitat) through off-site sediment transport due to flooding or erosion, spills of hydrocarbons or other contaminants, or direct loss of habitat from wildfires. The implementation of appropriate and site-specific mitigation or adaptation measures, including appropriate Project design, monitoring, maintenance of facilities, and response to incidents, are anticipated to effectively manage and mitigate these potential effects on the Project and the surrounding biophysical environment. Therefore, no residual effects of the environment on the Project are anticipated.

13.5 Determination of Significance for Effects of the Environment on the Project

Based on the significance definition criteria provided in **Section 13.1.3**, and in consideration of the proposed mitigation measures and management strategies provided above, the potential effects of the environment on the Project are not anticipated to be significant.

14.0 Accidents and Malfunctions

The purpose of this section is to identify the accidents, malfunctions and unplanned events that may occur during any phase of the Project. The assessment focuses on events that are considered credible based on the Project description and the experience of the EA team in assessing similar projects.

14.1 Scope of Assessment

The general approach to assessing the potential effects of accidents, malfunctions and unplanned events involves the following:

- Describing the potential accident, malfunction or unplanned event;
- Considering if the potential accident, malfunction or unplanned event could occur during the life of the Project, and during which phase(s) or activity(ies);
- Determining with which VEC(s) the potential accident, malfunction or unplanned event may interact;
- Describing the Project planning and safeguards established to minimize the potential for such occurrences to happen;
- Considering the contingency or emergency response procedures applicable to the event; and
- In consideration of the above, assessing the residual environmental effects of accidents, malfunctions or unplanned events on the related VECs, and determining the significance of the potential residual effects of these accidents, malfunctions or unplanned events (and their likelihood of occurrence, as applicable).

Spatial and temporal boundaries for considering residual environmental effects of potential accidents, malfunctions and unplanned events that may arise as a result of the Project are the same as those for each VEC to which they apply, and are presented in their respective sections in this document. Similarly, criteria for determining the significance of residual environmental effects with respect to potential accidents, malfunctions and unplanned events are the same as those for each applicable VEC.

14.2 Description of Potential Accidents, Malfunctions and Unplanned Events

Based on the nature of the Project, knowledge of the environment within which the Project is located, as well as the experience of OTW LP personnel, the following credible accidents, malfunctions and unplanned events have been identified for this assessment, and are described in greater detail in the following sections.

14.2.1 Accidental Release of Hazardous Materials

Hazardous materials will be stored and used on-site primarily for operation and maintenance of vehicles, machinery and WTG components during construction, operation and maintenance, and decommissioning. These materials include fuels (e.g., gasoline, diesel, propane, etc.), lubricants (e.g., grease, hydraulic fluid, engine oil, etc.) and coolants (e.g., ethylene glycol).

Accidental releases of hazardous materials may occur while operating, refuelling or servicing vehicles and equipment, as a result of human error or equipment malfunction, and through improper storage and handling of hazardous materials on-site.

14.2.2 Failure of WTG Components

Failure of WTG equipment may occur during the operation and maintenance phase, which may result in full or partial blade throws. These failures may result in damages to equipment or property, and could pose a risk to the health and safety of Project personnel, the public or wildlife. A literature review of publicly available information on WTG failures was completed by Garrad Hassan Canada Inc. (Garrad Hassan 2007), which indicated that these events are very rare, and data describing these events are scarce.

The primary types of blade failures on WTGs includes the following (Garrad Hassan 2007):

- Full blade failure at the root connection to the nacelle;
- Partial blade failure resulting from lightning strikes, equipment defects or buckling from excessive load;
- Failure at the outboard aerodynamic device; and
- Failure resulting from tower strikes.

Based on investigations conducted following blade failures, the following factors have been attributed to these failures:

- Human error;
- Environmental events or conditions that were unforeseen during WTG design;
- Incorrect design for actual operational loads;
- Poor manufacturing quality; and
- Failure of WTG control and safety systems.

14.2.3 Ice Throw

Under certain temperature and humidity conditions, ice can form and accumulate on WTG rotor blades, which can occur when the WTGs are stationary or in motion. When stationary, the accumulated ice will eventually break free and fall, in similar fashion to ice falling off other stationary structures, such as trees, buildings or overhead power lines.

When operating, ice can still accumulate on WTG blades while they are in motion. Observations suggest that ice may accumulate at higher rates in proportion to blade velocity; however, ice accumulation is hindered by flexing of the rotor blades (Garrad Hassan 2007). When ice detaches from rotor blades when they are in motion, these ice fragments can be thrown from the turbine, typically landing in the lane of the rotor, or downwind of the WTG. These thrown ice fragments have potential to cause damage to vehicles, machinery and property, and may pose a risk to the health and safety of on-site Project personnel and the public in the vicinity.

14.2.4 Fire

During the construction, operation and maintenance, and decommissioning phases, there is potential for the occurrence of fires as a result of some Project activities, including hot work (i.e., welding, grinding and cutting), vehicle and equipment travel where the hot exhaust systems may ignite dry vegetation, and improper storage and handling of flammable materials. Fires may also result from Project personnel smoking within or near the PDA.

While electrical components of the Project, including transformers, inverters, control systems, and other equipment, are designed to operate in compliance with applicable standards, there is potential for malfunctions to create excessive heat or an ignition source, which may in turn result in a fire occurrence.

14.2.5 Vehicle Accident

Vehicle accidents may occur during the construction, operation and maintenance, and decommissioning phases of the Project. However, the likelihood of a vehicle accident occurrence is expected to be at its highest during construction, as the number of on-site personnel will be at its highest, and the frequency of vehicle traffic will be greater due to the transportation and delivery of Project components and equipment.

Vehicle accidents include collisions with other vehicles, machinery, infrastructure, pedestrians or wildlife, and potentially pose a risk to the health and safety of workers, the public or wildlife. A fire or spill of hazardous materials could also occur as a consequence of a vehicle accident, compounding the initial effects by potentially threatening surface water, vegetation, wildlife and wildlife habitat, in addition to the health and safety of workers and the public.

14.3 Potential Interactions between Accidents, Malfunctions and Unplanned Events and Related Valued Ecosystem Components

Based on the nature of occurrence of the events described above and the EA team's knowledge of their potential to interact with the environment, the VECs with a reasonable potential to interact with the potential accidents, malfunctions or unplanned events that could result in residual environmental effects are identified in **Table 14-1**.

Table 14-1: Potential Interactions of Accidents, Malfunctions and Unplanned Events with Valued Ecosystem Components

Accident, Malfunction or Unplanned Event	Terrain and Soil	Vegetation And Wetlands	Wildlife and Wildlife Habitat	Heritage Resources	Community Services and Infrastructure
Accidental Release of Hazardous Materials	✓	✓	✓	✓	✓
Failure of WTG Components			✓		✓
Ice Throw			✓		✓
Fire	✓	✓	✓	✓	✓
Vehicle Accident		✓	✓		✓

Note: ✓ indicates a potential interaction.

Those accidents, malfunctions or unplanned events that may result in an interaction with a specific VEC are identified with a checkmark in the table above, and are therefore carried forward for further assessment in the following sections.

Accidents, malfunctions or unplanned events that are not identified with a checkmark in the table above are not expected to result in an interaction with a specific VEC or VECs. For these accidents, malfunctions or unplanned events, no residual effects on the specific VECs are anticipated to result from the Project.

14.4 Assessment of Potential Environmental Effects from Accidents, Malfunctions and Unplanned Events

This section includes the assessments of the potential environmental effects of each of the credible accidents, malfunctions and unplanned events for which an interaction was identified with a specific VEC or VECs, and the mitigation measures to address these potential effects.

14.4.1 Accidental Release of Hazardous Materials

The accidental release of hazardous materials through spills or leaks could primarily affect soil quality and wetland function, if not properly contained. Some hazardous materials contain compounds that are toxic to vegetation, and wildlife species; therefore, effects on vegetation and wetlands from an accidental hazardous materials release includes physical harm or death of vegetation species, a reduction or loss of wetland function as a habitat for wildlife, and accretion of contaminants in wetland sediments. Contaminants are less likely to move through a wetland system at the same rate as riparian systems due to the low mobility of water and sediments. Contaminants may build up in the sediments and be released into the ecosystem over time, rather than being flushed out over a season as with a riparian system.

Soils, vegetation and wildlife habitat can also be adversely affected during remediation and reclamation activities to address accidental spills of hazardous materials. Soil disturbance associated with spill remediation can also affect undiscovered heritage resources.

Accidental spill events involving large volumes and/or areas of extent, or spills that may occur within or adjacent to public roads may require assistance of local community services, such as the RCMP, fire departments or contractors (e.g., vacuum truck operators), which may in turn result in increased demand on these local community services. Further, spills near public roads may result in temporary restrictions or closures of public roads to facilitate remediation and reclamation activities.

14.4.1.1 Mitigation

Key mitigation to address the potential effects from accidental release of a hazardous material includes:

- A Project-specific Emergency Response Plan (ERP) with defined contingency and emergency response procedures in the event of a hazardous material spill will be developed and implemented throughout the construction, operation and maintenance, and decommissioning phases;
- A Spill Contingency Plan will be developed as part of the ERP for substances anticipated to be stored and used on-site during construction, operation and maintenance, and decommissioning;
- All potentially hazardous materials will be stored in appropriate containers and handled in designated locations on-site (e.g., site laydown yard) away from all natural lands, in accordance to applicable legislation and permit requirements;
- All fuels will be stored, and refuelling and maintenance of vehicles and equipment will be conducted a minimum of 100 m from all wetlands and drainages;
- Material storage areas will be regularly inspected by the construction contractor and Environmental Monitor to ensure that containers are secure and potential spills and leaks are mitigated;
- All Project personnel will practice good housekeeping, including daily clean-up of debris within and near the PDA;
- Emergency spill response materials will be available on-site at all times during the construction, operation and maintenance, and decommissioning phases;
- On-site Project personnel, including OTW LP staff and contractors, will be trained in emergency response procedures and protocols during onboarding, including response to accidental releases of hazardous materials;
- Project personnel responsible for handling hazardous waste materials will possess valid certification in Workplace Hazardous Materials Information Systems training. Additionally, all drivers transporting hazardous materials (i.e., fuel truck operators) will possess valid Transportation of Dangerous Goods certification;
- All on-site and off-site spills related to the Project will be reported to appropriate OTW LP personnel and the Environmental Monitor, regardless of the size. Where required, spills will be

reported to provincial agencies in accordance with the *Environmental Management and Protection Act* (Government of Saskatchewan 2010a).

Mitigation measures to reduce the potential effects of accidental spills of hazardous materials are also included in the EPP (see **Appendix C**).

14.4.2 Failure of WTG Components

While they are considered to be infrequent events, failures of WTG components have been previously documented on existing wind energy projects. These failure events have the potential to damage Project equipment, which could in turn result in fires, falling or thrown equipment fragments (e.g., rotor blades or blade fragments), or contact with high voltage. These events can pose risks to the health and safety of Project personnel, the public and wildlife that may be in the vicinity.

The wind energy industry is relatively recent when compared to other conventional energy production industries, such as those related to fossil fuels, and technologies, design standards and best practices associated with wind energy are continually evolving. According to Garrad Hassan (2007), the root causes of WTG equipment failures have been continually addressed through developments in best practices in design, testing, manufacturing and operation. Much of these developments have been incorporated into the International Electrotechnical Commission (IEC) standards series for WTGs, to which all large-scale WTGs must comply, including those proposed for the Project.

14.4.2.1 Mitigation

Since accidents and malfunctions of WTG components are considered to be infrequent events, the current design, testing, manufacturing and operation standards to which all large WTGs must adhere are anticipated to further reduce their likelihood of occurrence in the future.

In addition to compliance with IEC standards, the following mitigation measures were/will be implemented to reduce potential effects of WTG component failure on the Project:

- Project design has incorporated appropriate setback distances of WTGs to residences, overhead transmission lines, and public roads;
- WTGs selected for the Project are rated to withstand the climate conditions typical of the Project area;
- WTGs will be equipped with safety systems that are compliant with industry standards, which operate independently of the normal operating systems, so rotor speed can be controlled in the event of failure of one system. WTGs will also be equipped with lightning protection systems and control systems that recognize excessive wind speeds, which are compliant with industry standards. These systems will be designed to control the WTGs appropriately in the event of extreme weather events;

- All WTGs will be inspected by qualified personnel prior to operation to identify any faults in design, manufacture or construction. WTGs will be regularly inspected and maintained throughout the operation and maintenance phase; and
- Local emergency response agencies will be familiarized with the Project facilities and the ERPs developed for the Project.

14.4.3 Ice Throw

Ice fragments thrown from rotating blades of WTGs have the potential to damage vehicles, equipment and property. These ice fragments may also pose risks to the health and safety of Project personnel, the public and wildlife that may be in their path when they detach from the blades. According to ice throw modelling described in Garrad Hassan (2007), very high wind speeds are required to cause ice fragments of any significant mass to be thrown beyond 50 m from the base of a stationary 2.0 MW WTG. Larger, operational turbines are expected to be capable of throwing ice fragments a proportionally further distance.

Given the Project's location in a very sparsely populated area of southern Saskatchewan, coupled with the infrequent and typically unpleasant weather conditions necessary for icing conditions to occur (e.g., freezing rain), the likelihood of potential effects on the environment from ice throw is considered to be low.

14.4.3.1 Mitigation

Key mitigation to address the potential effects from ice throw includes:

- Project design has incorporated appropriate setback distances of WTGs to residences, overhead transmission lines, and public roads;
- WTGs will be equipped with systems that will detect ice on the rotor blades by comparing real-time performance data with normal operating data, and then alert operations personnel;
- WTGs will be stopped when ice accumulation poses a risk to the environment and Project infrastructure; and
- Operations personnel will be educated on established protocols to identify when ice accumulation may occur on the WTGs, and the procedures to address and mitigate the potential for ice throw to occur.

14.4.4 Fire

Fires may inadvertently result from Project activities (i.e., hot work, travel across dry vegetation, smoking on-site) during the Project construction, operation and maintenance, and decommissioning phases. In prairie landscapes where warm, dry and windy conditions are common, fires can spread quickly, which may pose a health and safety risk to workers and the public, and affect the vegetation communities, wildlife populations and wildlife habitat availability if a fire spreads beyond the boundaries of the PDA.

Similar to the potential effects of accidental releases of hazardous materials, soils, vegetation, wildlife habitat and undiscovered heritage resources may be adversely affected by activities to extinguish fires that involve soil disturbance (e.g., establishing fire breaks, smothering flames with soils).

Fires may require assistance of local community services, such as fire departments and other emergency service providers, which may in turn result in increased demand on these local community services. Further, temporary road closures may be realized to allow emergency personnel to appropriately address the fire.

14.4.4.1 Mitigation

Key mitigation to address the potential effects from accidental fires includes:

- A Project-specific ERP with defined contingency and emergency response procedures in the event of a fire will be developed and implemented throughout the construction, operation and maintenance, and decommissioning phases;
- Project vehicle and equipment will be regularly inspected maintained;
- All vehicles and mobile equipment on the Project will be equipped with fire suppression equipment, such as fire extinguishers and hand shovels;
- Fire suppression equipment on-site will be regularly inspected and serviced in accordance with provincial regulations;
- All on-site Project personnel will be trained in fire suppression and the emergency response procedures included in the ERP during onboarding;
- Fire detection and alert systems will be established on-site during the Project construction, operation and maintenance, and decommissioning phases;
- Project vehicle and equipment traffic will be restricted to designated travel corridors;
- Smoking will be restricted to designated areas within the Project site;
- Local emergency response agencies will be familiarized with the Project facilities and the ERPs developed for the Project; and
- Project work will be modified during hot, dry weather conditions to reduce the potential for fire occurrence, such as rescheduling specific work activities or avoiding areas near vegetated areas.

Mitigation measures to address the potential effects of fire risk are also included in the EPP (see **Appendix C**).

14.4.5 Vehicle Accidents

Vehicles will be active across the PDA throughout the construction, operation and maintenance, and decommissioning phases of the Project, as well as along Highway 34 north and south of the PDA. However, the likelihood of vehicle accident occurrence is higher during construction, when vehicle traffic is anticipated to be higher.

Vehicle collisions have the potential to risk human health and safety and other property such as Project infrastructure or private property. Fuel spills resulting from a vehicle accident could adversely affect vegetation communities, and wetlands may become contaminated by fuel. Vehicle accidents could have a direct effect on wildlife in the event of vehicle-to-wildlife collision, and an indirect effect in the event of a fuel spill or fire resulting from a vehicle collision.

14.4.5.1 Mitigation

Key mitigation to prevent vehicle accidents related to the Project includes:

- A traffic management plan will be developed and implemented throughout construction, which will identify preferred transportation routes for Project vehicles and equipment to optimize safety to personnel and the public;
- Vehicles travelling to and from the Project site will adhere to posted speed limits, weight restrictions, and other traffic safety rules, and drivers will adjust their speed to conditions accordingly;
- Drivers will also heed wildlife warning signs and reduce speed in areas identified as posing a potential risk of wildlife collision;
- Safety zones with posted speeds will be identified throughout the Project site;
- Pedestrian zones will be identified to allow workers access throughout work areas on foot;
- A communications plan will be established to engage with local communities potentially affected by Project-related traffic;
- A Project-specific ERP with defined contingency and emergency response procedures in the event of a vehicle accident will be developed and implemented throughout the construction, operation and maintenance, and decommissioning phases; and
- Dust control will be implemented if and when needed to improve visibility (i.e., water spraying on roads).

Mitigation measures to address the potential effects of vehicle accidents are also included in the EPP (see **Appendix C**).

14.5 Summary of Assessment of Accidents, Malfunctions and Unplanned Events

The potential occurrence of accidents, malfunctions or unplanned events has been considered as part of the Project design, and will continue to be considered throughout Project planning. Measures to reduce the potential occurrence of accidents, malfunctions or unplanned events will continue to be developed and updated with additional site-specific details as Project planning progresses. Safeguards will be implemented throughout the construction, operation and maintenance, and decommissioning phases, and ERPs will be developed before any work is initiated on the Project so that incidents can be managed effectively.

By ensuring that all aspects of the Project adhere to applicable codes and standards, as well as implementing the mitigation measures outlined above and in the EPP included in **Appendix C**, the likelihood for adverse environmental effects arising from accidents, malfunctions, or unplanned events is greatly reduced. Furthermore, by implementing a site-specific ERP and management plans during all phases of the Project, the residual environmental effects that may arise from Project-related accidents, malfunctions, and unplanned events Project are not considered significant.

15.0 Summary and Conclusion

This EIS document has been prepared to describe the planned development of the Project that is being proposed by OTW LP. It is intended to fulfill the regulatory requirements for the Project as described in the Province of Saskatchewan's *Environmental Assessment Act*. This EIS was prepared in accordance with the TOR developed for the Project and approved by ENV via email on January 29th, 2020.

15.1 Summary

A summary of key findings from the EA that was completed for the Project is provided below. These key findings are focused on the primary issues and concerns that were provided by the ENV in their Ministerial Determination issued for the Project, in which the Project was deemed a "development" as per the criteria under Section 2(d) of the *Environmental Assessment Act* (Government of Saskatchewan 1980a).

Project Development and Siting

- An iterative approach was followed during Project development and siting. Early alternative Project layouts underwent several iterations as regulatory guidance within Saskatchewan evolved, and to adapt to site constraints identified through the evaluation process.
- The final Project layout has been extensively revised from the layout that was proposed in the TPP (Stantec 2018), with revisions and updating based on the findings of the desktop constraints analysis and reconnaissance surveys, community engagement, regulatory review, available technology (e.g., turbine models) and detailed field studies.
- The Project layout avoids all wind project avoidance zones, as outlined in the *Wildlife Siting Guidelines for Saskatchewan Wind Energy Projects* (ENV 2019).
- OTW LP selected the largest available turbines for the Project, which reduced the total number of turbines from 50 turbines, as presented in the TPP, down to 33 turbines in this final layout. The reduction in the number of turbines has also reduced the overall area of habitat affected by sensory disturbance.
- The final layout of the PDA encompasses approximately 182.5 ha, which is a substantial reduction from the 278 ha PDA proposed in the TPP. Only 25.1 ha (13.7% of the PDA) are expected to be occupied by permanent infrastructure compared to the 29 ha from the TPP layout. The remaining 157.5 ha will be used as temporary work areas during construction.
- Based on the final layout, approximately 8.3 ha of native grassland will be affected construction, which is a 61.5% reduction from the area of native grassland (21.6 ha) that would have been affected in the layout presented in the TPP (Stantec 2018). Most (91.4%) of the grassland disturbed will be temporary to install underground collector lines or temporary roads for construction, and will be returned to grassland following construction.
- Of the 25.1 ha permanent footprint within the PDA, 3.0 ha (12%) will consist of suitable wildlife habitat (i.e., grassland, wetlands, drainages, shrublands broadleaf land cover and tame

pasture/forage), with tame pasture/ forage accounting for most (2.3 ha) of this area. This total area accounts for 0.3% of the suitable wildlife habitat within the wildlife and wildlife habitat LAA.

Potential Effects on Plant and Wildlife SOMC

- No federally listed plant SOMC were detected during the desktop reviews and detailed field studies.
- A total of 21 provincially-tracked plant SOMC were observed in 168 locations during the field surveys. OTW LP's iterative approach to development and siting of the final layout resulted in the avoidance of the majority of these identified occurrences and their respective 30 m setback distances, as outlined in the *Saskatchewan Activity Restriction Guidelines for Sensitive Species* (ENV 2017). As a result, only 9 plant SOMC were identified in 28 locations within 30 m setback distance but outside of the PDA, and 6 SOMC were observed in 15 locations within the PDA boundary. Of the 15 observation locations within the PDA, 13 are located within the ROWs of underground and overhead collector lines, as well as access roads. It is anticipated that these ROWs can be realigned through micro-siting to avoid these observed plant SOMC occurrences. The two remaining plant SOMC occurrences identified in the PDA are located within a WTG temporary construction workspace area in SE-09-03-24-W2M. These plant SOMC are anticipated to be avoided through siting of the temporary workspace.
- Sensitive features associated with wildlife SOMC that were identified during field studies, as well as the applicable setback distances outlined in the *Saskatchewan Activity Restriction Guidelines for Sensitive Species* (ENV 2017) were avoided by the PDA where possible. The Project is in compliance with the guidelines (ENV 2017), with the following exceptions:
  - The 1 km setback around a ferruginous hawk nest overlaps the PDA, but only at the location of a ROW for underground collector lines, which will be temporarily disturbed during construction; the nearest point of the underground collector lines is at 730 m. Construction activities within this setback will occur outside of the activity restriction period (March 15 to July 15) and be confined to the construction workspace for those components.
  - The 400 m setbacks around five sharp-tailed grouse leks overlap the PDA, including underground and overhead collector line routes, access roads and /or WTG pads. Note that some leks occurred within 400 m of regularly used municipal roads. Construction activities within the 400 m setback will occur outside of the activity restriction period (March 15 to May 15) and will be confined to the construction workspace.
  - The 500 m setbacks around five northern leopard frog breeding ponds overlap the PDA, including WTGs pads, temporary workspaces, access roads, and underground and overhead collector lines. Construction activities at these locations will be confined to the construction workspace.
- Through avoidance of natural land cover types to the highest feasible extent during Project development and siting, and application of mitigation measures outlined in **Section 8.0** and **9.0**

of this document and the EPP in **Appendix C**, the potential residual effects on plant and wildlife SOMC during construction are considered low.

- Through the application of mitigation measures outlined in **Section 8.0** and **9.0** of this document and the EPP in **Appendix C**, and adopting the *Adaptive Management Guidelines for Saskatchewan Wind Energy Projects* (ENV 2018), the potential residual effects during operation and maintenance are considered negligible for plant SOMC, and low for wildlife SOMC.

Bird and Bat Occurrence and Movement based on Data from Field Studies

- The Project is located south of the Big Muddy Valley, which is characterized by a ridge of forested coulees. Control sites for the bird movement surveys were sited along the valley in order to assess if this landscape feature could act as a corridor for migrating birds and therefore have higher number of birds than within the Project area. However, results from the bird movement surveys showed that bird movement rates at the control sites were similar to those within the Project area. Based on the data collected, it appears that the Big Muddy Valley does not concentrate bird movement during migration more so than the surrounding landscape. Furthermore, there are no other prominent features on the landscape near the Project area that could serve as a concentration site for birds (e.g., a large body of water), thereby lowering the potential for an increased level of interaction between the Project and birds.
- The majority of bird observations within the wildlife and wildlife habitat LAA were landbirds (74.3% spring, 82.2% fall), followed by waterfowl (13.7% spring, 14.2% fall) and raptors (7.7% spring and 2.9% fall). The bird movement rates observed within the wildlife and wildlife habitat LAA were similar to the bird movement rates found at the control sites outside of the LAA; however, Site 3 (located between SW-15 and SE-16-03-25-W2M) and Site 5 (located in SW-12-03-24-W2M) consistently had higher bird movement rates compared to the other sites in the LAA and the control sites. The higher abundance of birds at these sites was due to flocks of American crow and blackbird species at both sites during spring and fall, and a flock of horned lark at Site 5 in the spring.
- No clear movement corridors through the wildlife and wildlife LAA were identified, based on the data from the spring and fall bird movement surveys.
- Based on the data from the bat activity surveys, bat activity rates were an average of 0.2 migratory bat passes per detector night during the 2016 spring monitoring period, 2.0 migratory bat passes per detector night in 2015 and 2.4 migratory bat passes per detector night in 2016 during the fall monitoring period (August 1 to September 10) at the elevated detectors.
- According to the guidelines established in the Alberta Framework (ESRD 2013b), the calculated bat activity rates for the Project fall within the moderate category for migratory bat fatality risk. However, the recent meta-study by Solick *et al*. (2020) confirmed previous meta-analysis results from Hein *et al*. (2013) that predicting the mortality risk to bats from wind energy projects using pre-construction survey data is not feasible, despite the weak relationship with small sample size reported in the Baerwald and Barclay (2009) study, which has been adopted as the guidance thresholds in the Alberta Framework (ESRC 2103b). Therefore, predicting the potential change

in mortality risk of bats as a result of the Project based on pre-construction bat activity is not based on strong scientific evidence.

- Given the uncertainty in wildlife mortality rates, particularly birds and bats, at wind energy turbine facilities, OTW LP is committed to the application of the *Adaptive Management Guidelines for Saskatchewan Wind Energy Projects* (ENV 2018) to ensure that bird and bat mortality rates are consistent with rates acceptable within Saskatchewan.

Mitigation Commitments

- Avoidance of natural land cover types and sensitive environmental features will continue to be the primary mitigative strategy throughout all phases of the Project.
- Project-specific mitigation measures will be implemented prior to and throughout construction, with priority placed on avoidance of natural land cover types and sensitive environmental features through micro-siting Project components, to minimize the size of the Project footprint and effects on native vegetation and wildlife habitats.
- The setbacks prescribed in the *Saskatchewan Activity Restriction Guidelines for Sensitive Species* (ENV 2017) will be maintained for the Project wherever possible.
- OTW LP is committing to conduct a thorough Post-Construction Monitoring Program, based on the Adaptive Management Plan included in the EPP (**Appendix C**), and in accordance with the *Adaptive Management Guidelines for Saskatchewan Wind Energy Projects* (ENV 2018).

15.2 Conclusion

The EA completed for the Project, and described in the EIS document, incorporated an accepted and defensible methodology to scope potential effects pathways, acquire appropriate data (through both desktop and field studies), analyze data and discuss the potential severity and likelihood of residual effects subsequent to application of mitigation measures. Using this process, the EIS concluded that there would be no significant adverse residual effects from the Project on all selected VECs (i.e., acoustic environment, terrain and soil, vegetation and wetlands, wildlife and wildlife habitat, heritage resources, employment and economy and community services and infrastructure) during all phases assessed and in consideration of normal activities of the Project as planned. Further, the EIS concluded that the Project-specific residual effects on vegetation and wetlands, as well as wildlife and wildlife habitat, would have a negligible contribution to the cumulative residual effects from past and current activities within the RAA, which were already significant. The proponent has committed to monitoring programs and follow-up studies to examine the accuracy of predictions of residual effects.

In summary, the residual environmental effects of the Project are expected to be manageable, which will allow for the appropriate development of the Project to help meet SaskPower's goal of increasing renewable energy and reducing greenhouse gas emissions in the Province of Saskatchewan.

16.0 Closure

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

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This report has been prepared by a team of Dillon professionals on behalf of Outlaw Trail Wind LP.

Respectfully submitted,

DILLON CONSULTING LIMITED

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Appendix A

Concordance Table

Table A.1: Concordance between the Terms of Reference and Environmental Impact Statement

Section	Terms of Reference	Section	Environmental Impact Statement
1	Introduction	1.0	Introduction
2	Project Overview	1.1	Project Overview
2.1	Project Description	2.0	Project Description
2.2	Project Boundaries	4.2.3	Identification of Assessment Boundaries
2.2.1	Spatial Boundaries	4.2.3.1	Spatial Boundaries
2.2.2	Temporal Boundaries	4.2.3.2	Temporal Boundaries
2.3	Project Alternatives	2.3	Project Alternatives
2.4	Ancillary Projects	2.9	Ancillary Projects
2.5	Regulatory Requirements	1.3	Regulatory Framework
3	Indigenous, Public and Regulatory Engagement	3.0	Engagement
		Appendix D	Engagement Program Materials
3.1	Overall Objectives	3.1	Objectives of the Engagement Program
3.2	Indigenous Engagement	3.2.2	Indigenous Engagement
3.2.1	Identification of Potentially Affected Indigenous Communities	3.2.2	Indigenous Communities
3.2.2	Approach to Indigenous Engagement	3.3.5	Indigenous Engagement
3.3	Public and Regulatory Engagement	3.2.1	Stakeholders
3.3.1	Stakeholder Identification	3.2	Identification of Interested Parties
3.3.2	Engagement Methods	3.3	Engagement Methods and Outcomes
3.3.3	Information Materials and Sources	3.3.8	Information Materials and Sources
		3.3.9	Project Website and E-mail Address
3.3.4	Tracking and Documentation	3.3.10	Tracking and Documentation
4	Environmental Assessment	4.0	Environmental Assessment Scope and Methods
4.1	Overview of Assessment Approach	4.1	Overview of the Approach
4.1.1	Scoping of the Assessment	4.2	Scoping of the Assessment
4.1.2	Existing Conditions	4.3	Existing Conditions
		5.0	Environmental Setting
4.1.3	Assessment	4.4	Assessment of Environmental Effects
4.1.4	Selection of Valued Ecosystem Components	4.2.1	Selection of Valued Ecosystem Components
4.2	Acoustic Environment	6.0	Assessment of Potential Effects on Acoustic Environment
4.2.1	Spatial Boundaries	6.1.4	Boundaries
4.2.2	Significance Criteria	6.1.6	Significance Definition
4.2.3	Existing Conditions	6.2	Existing Conditions for Acoustic Environment
		Appendix F	Noise Impact Assessment Technical Report

Section	Terms of Reference	Section	Environmental Impact Statement
4.2.4	Environmental Effects Analyses	6.3	Project Interactions with Acoustic Environment
		6.4	Assessment of Residual Environmental Effects on Acoustic Environment
		6.5	Assessment of Cumulative Environmental Effects on Acoustic Environment
		6.6	Determination of Significance
		6.7	Prediction Confidence
		6.8	Follow-Up and Monitoring
		Appendix C	Environmental Protection Plan
4.3	Terrain and Soil	7.0	Assessment of Potential Effects on Terrain and Soil
4.3.1	Spatial Boundaries	7.1.4	Boundaries
4.3.2	Significance Criteria	7.1.6	Significance Definition
4.3.3	Existing Conditions	7.2	Existing Conditions for Terrain and Soil
4.3.4	Environmental Effects Analyses	7.3	Project Interactions with Terrain and Soil
		7.4	Assessment of Residual Environmental Effects on Terrain and Soil
		7.5	Assessment of Cumulative Environmental Effects on Terrain and Soil
		7.6	Determination of Significance
		7.7	Prediction Confidence
		7.8	Follow-Up and Monitoring
		Appendix C	Environmental Protection Plan
4.4	Vegetation and Wetlands	8.0	Assessment of Potential Effects on Vegetation and Wetlands
4.4.1	Spatial Boundaries	8.1.4	Boundaries
4.4.2	Significance Criteria	8.1.6	Significance Definition
4.4.3	Existing Conditions	8.2	Existing Conditions for Vegetation and Wetlands
		Appendix G	Biophysical Mapset
		Appendix H	Vegetation and Wetlands Supplementary Information
4.4.4	Environmental Effects Analyses	8.3	Project Interactions with Vegetation and Wetlands
		8.4	Assessment of Residual Environmental Effects on Vegetation and Wetlands
		8.5	Assessment of Cumulative Environmental Effects on Vegetation and Wetlands
		8.6	Determination of Significance
		8.7	Prediction Confidence
		8.8	Follow-Up and Monitoring
		Appendix B	Commitments Register
		Appendix C	Environmental Protection Plan

Section	Terms of Reference	Section	Environmental Impact Statement
4.5	Wildlife and Wildlife Habitat	9.0	Assessment of Potential Effects on Wildlife and Wildlife Habitat
4.5.1	Spatial Boundaries	9.1.4	Boundaries
4.5.2	Significance Criteria	9.1.6	Significance Definition
4.5.3	Existing Conditions	9.2	Existing Conditions for Wildlife and Wildlife Habitat
		Appendix G	Biophysical Mapset
		Appendix I	Wildlife and Wildlife Habitat Supplementary Information
4.5.4	Environmental Effects Analyses	9.3	Project Interactions with Wildlife and Wildlife Habitat
		9.4	Assessment of Residual Environmental Effects on Wildlife and Wildlife Habitat
		9.5	Assessment of Cumulative Environmental Effects on Wildlife and Wildlife Habitat
		9.6	Determination of Significance
		9.7	Prediction Confidence
		9.8	Follow-Up and Monitoring
		Appendix B	Commitments Register
		Appendix C	Environmental Protection Plan
4.6	Heritage Resources	10.0	Assessment of Potential Effects on Heritage Resources
4.6.1	Spatial Boundaries	10.1.4	Boundaries
4.6.2	Significance Criteria	10.1.6	Significance Definition
4.6.3	Existing Conditions	10.2	Existing Conditions for Heritage Resources
		Appendix J	Heritage Resources
4.6.4	Environmental Effects Analyses	10.3	Project Interactions with Heritage Resources
		10.4	Assessment of Residual Environmental Effects on Heritage Resources
		10.5	Assessment of Cumulative Environmental Effects on Heritage Resources
		10.6	Determination of Significance
		10.7	Prediction Confidence
		10.8	Follow-Up and Monitoring
		Appendix B	Commitments Register
		Appendix C	Environmental Protection Plan
4.7	Employment and the Economy	11.0	Assessment of Potential Effects on Employment and the Economy
4.7.1	Spatial Boundaries	11.1.4	Boundaries
4.7.2	Significance Criteria	11.1.6	Significance Definition
4.7.3	Existing Conditions	11.2	Existing Conditions for Employment and the Economy

Section	Terms of Reference	Section	Environmental Impact Statement
4.7.4	Environmental Effects Analyses	11.3	Project Interactions with Employment and Economy
		11.4	Assessment of Residual Environmental Effects on Employment and Economy
		11.5	Assessment of Cumulative Environmental Effects on Employment and Economy
		11.6	Determination of Significance
		11.7	Prediction Confidence
		11.8	Follow-Up and Monitoring
		Appendix B	Commitments Register
		Appendix K	Employment and Economy
4.8	Community Services and Infrastructure	12.0	Assessment of Potential Effects on Community Services and Infrastructure
4.8.1	Spatial Boundaries	12.1.4	Boundaries
4.8.2	Significance Criteria	12.1.6	Significance Definition
4.8.3	Existing Conditions	12.2	Existing Conditions for Community Services and Infrastructure
4.8.4	Environmental Effects Analyses	12.3	Project Interactions with Community Services and Infrastructure
		12.4	Assessment of Residual Environmental Effects on Community Services and Infrastructure
		12.5	Assessment of Cumulative Environmental Effects on Community Services and Infrastructure
		12.6	Determination of Significance
		12.7	Prediction Confidence
		12.8	Follow-Up and Monitoring
		Appendix B	Commitments Register
4.9	Effects of the Environment on the Project	13.0	Effects of the Environment on the Project
4.9.1	Spatial Boundaries	13.1.2	Boundaries
4.9.2	Significance Criteria	13.1.3	Significance Definition
4.9.3	Existing Conditions	13.2	Assessment of Severe Weather on the Project
		13.3	Assessment of Wildfires on the Project
4.9.4	Environmental Effects Analyses	13.2	Assessment of Severe Weather on the Project
		13.3	Assessment of Wildfires on the Project
		Appendix B	Commitments Register
		Appendix C	Environmental Protection Plan
4.10	Accidents and Malfunctions	14.0	Accidents, Malfunctions and Unplanned Events
5	Decommissioning and Institutional Control	2.5.3	Decommissioning and Abandonment

Section	Terms of Reference	Section	Environmental Impact Statement
5.1	Reclamation	2.5.3.1	Reclamation
5.2	Institutional Control	2.5.3	Decommissioning and Abandonment
6	Conditions Management	Appendix B	Commitments Register
6.1	Commitments Register	Appendix B	Commitments Register
7	References	17.0	References

Appendix B

Commitments Register

Table B.1: Commitments Register

ID	Commitment	Section in EIS	Condition in Approval	Permit # (if available)	Name and Section of Additional Report	Approving Agency/ Branch	Measure of Compliance	Commitment Status (met, not met, in progress)	Preventative or Corrective Action	Adaptive Action	Commitment Due Date	Actual Completion Date	Comments
1	Sounds levels during Project operation and maintenance phase will be below the permissible daytime and nighttime sound levels at all noise receptors within the LAA	Section 6.4; Appendix F				N/A	• Consideration of the findings from the Noise Impact Assessment during Project siting and design	Met	• Changes made to the Project layout or selected turbine model that differ from those included in the Noise Impact Assessment will not result in increased contributions to the acoustic environment by the Project. Subsequent noise modelling will be completed to confirm compliance with AUC Rule 012, if required.	•	Upon confirmation of the final Project layout and turbine selection prior to construction		
2	Minimize noise levels from Project vehicles and equipment during construction	Section 6.3; Appendix C, Sections 3.3.1 and 3.3.2; Appendix F				N/A	• Communication with landowners • Tracking public complaints	In progress	• Vehicles and equipment will be maintained regularly and equipped with mufflers to reduce construction noise. • Construction and equipment noise will be limited to the hours of 7:00 am to 10:00 pm.	•	Upon completion of construction activities		
3	Avoid or minimize disturbance to terrain integrity during Project construction and decommissioning	Section 7.4.2.2; Appendix C, Section 3.3.4				Saskatchewan Ministry of Environment - Fish, Wildlife and Lands Branch (ENV-FWLB)	• All Project activities are limited to the boundaries of the PDA • Terrain integrity within the PDA remains similar to pre-construction conditions throughout all Project phases, and post-construction	In progress	• Project components will be sited to avoid steep or stable topographic features, where feasible. • Graded areas will be re-contoured and reclaimed to a stable surface profile. • Existing public roads and previously disturbed areas will be used where possible to provide access throughout the PDA. • Natural drainage patterns will be maintained, where practical. • Sediment and erosion control measures will be established. • A post-construction monitoring program will be established to monitor the effectiveness of measures to mitigate effects to terrain integrity.	•	Upon completion of construction and decommissioning activities		

ID	Commitment	Section in EIS	Condition in Approval	Permit # (if available)	Name and Section of Additional Report	Approving Agency/ Branch	Measure of Compliance	Commitment Status (met, not met, in progress)	Preventative or Corrective Action	Adaptive Action	Commitment Due Date	Actual Completion Date	Comments
4	Avoid or minimize soil loss during Project construction and decommissioning	Section 7.4.3.2; Appendix C, Sections 3.3.4 and 3.3.5				ENV - FWLB	• All Project activies` are limited to the boundaries of the PDA • Post-construction and post-reclamation soil availability and distribution are similar to pre-construction conditions.	In progress	• Soil disturbance will be limited to the extent required for construction and decommissioning activities. • Proper soil management techniques will be used during construction and decommissioning, including separation of topsoil and subsoils. • Sediment and erosion control measures will be established. • Stockpiled soil will be stored outside of natural drainage areas. • Soils will be promptly replaced and recontoured in disturbed non-operational areas of the PDA following construction. • Disturbed areas of the PDA not subject to annual cultivation for agricultural production will be promptly seeded following construction and/or decommissioning to minimize erosion potential.	•	Upon completion of post-reclamation monitoring		
5	Avoid or minimize changes to soil quality during Project construction and decommissioning	Section 7.4.4.2; Appendix C, Sections 3.3.4, 3.3.5, and 3.3.12				ENV - FWLB	• Post-construction and post-reclamation soil agricultural capability is similar to pre-construction conditions. • Establishment of spill prevention and response procedures during Project construction, operation and maintenance and decommissioning.	In progress	• Soil disturbance will be limited to the extent required for construction and decommissioning activities. • Proper soil management techniques will be used during construction and decommissioning, including separation of topsoil and subsoils. • Sediment and erosion control measures will be established. • Project vehicles and equipment will arrive on-site clean and free of leaks or contaminant residue. Vehicles and equipment will be regularly inspected and maintained, and will be equipped with spill response materials. • Spill prevention and response procedures will be established, and spill events will be promptly and appropriately addressed.	•	Upon completion of post-reclamation monitoring		

ID	Commitment	Section in EIS	Condition in Approval	Permit # (if available)	Name and Section of Additional Report	Approving Agency/ Branch	Measure of Compliance	Commitment Status (met, not met, in progress)	Preventative or Corrective Action	Adaptive Action	Commitment Due Date	Actual Completion Date	Comments
6	Avoid or minimize disturbance to native vegetation communities during Project construction and decommissioning	Section 8.4.2.2; Appendix C, Section 3.3.6				ENV - FWLB and Environmental Assessment and Stewardship Branch (EASB)	• All Project activies` are limited to the boundaries of the PDA • Post-reclamation native vegetation communities within the PDA have similar species diversity and vigor as those documented during pre-construction surveys.	In progress	• Through an iterative approach to Project development and sing,` naveą vegetation communities have been avoided where feasible. If possible, Project components and construction activities will be micro-sited to further avoid naveą vegetation communities. • The extents of vegetation clearing will be clearly staked within the PDA. Vehicle and equipment access within nave` land cover types that support native vegetation communities will be limited to the smallest areas possible that will still allow safe completion of construction activieąs. Construction activities within naveą land cover types will be limited to dry or frozen ground conditions. Activities during other Project phases will be restricted to previously disturbed areas of the PDA. • A reclamation plan will be developed for the Project, in consultation with ENV, to reclaim areas disturbed during construction and decommissioning, which will focus on areas of naveą land cover. • Post-construction and post-decommissioning monitoring programs will be implemented to evaluate the success of vegetation re-establishment following reclamation, and identify areas where additional reclamation work may be required. • Where losses to native vegetation communities cannot be avoided or fully mitigated against, OTW LP will determine an appropriate approach to offset residual impacts following construction completion when the specific extent of those impacts are known.	•	Upon completion of post-reclamation monitoring		

ID	Commitment	Section in EIS	Condition in Approval	Permit # (if available)	Name and Section of Additional Report	Approving Agency/ Branch	Measure of Compliance	Commitment Status (met, not met, in progress)	Preventative or Corrective Action	Adaptive Action	Commitment Due Date	Actual Completion Date	Comments
7	Avoid plant SOMC during Project construction and decommissioning	Section 8.4.3.2; Appendix C, Section 3.3.6				ENV - FWLB and EASB	• Activity restriction setbacks for plant SOMC are maintained, unless previously discussed and authorized by ENV.	In progress	• The Project layout was developed to avoid identified plant SOMC and their respecve` setbacks to the extent feasible. The remaining plant SOMC observations and/or a 30 m setbacks overlapped by the PDA are located within temporary workspaces, which will be adjusted on-site to avoid these sensiveą areas. • If the 30 m setbacks around these plant SOMC locations cannot be avoided by Project activities, appropriate mitigation measures to reduce the potential effects of the Project on the specific SOMC occurrences (e.g., schedule activities outside of the growing season, placement of mang` or other protective barriers over the plant populations) will be discussed with ENV.	•	Upon completion of construction and decommissioning activities		

ID	Commitment	Section in EIS	Condition in Approval	Permit # (if available)	Name and Section of Additional Report	Approving Agency/ Branch	Measure of Compliance	Commitment Status (met, not met, in progress)	Preventative or Corrective Action	Adaptive Action	Commitment Due Date	Actual Completion Date	Comments
8	Avoid or minimize introduction and/or spread of non-native invasive plant species by Project activities	Section 8.4.3.2; Appendix C, Section 3.3.6				ENV - FWLB and EASB	• Non-native invasive plant species are not introduced or spread within the PDA. • Establishment of a vegetation management plan during Project construction, operation and maintenance and decommissioning.	In progress	• All vehicles and equipment will arrive to the Project free of soil and vegetaveą debris and propagules, to migaăte the potential for the introduction of invasive weeds. • Areas of weed infestation within the PDA will be marked on-site for avoidance. Where avoidance is not possible, access matting or other barriers will be used, or topsoil stripped from infested areas will be salvaged and stockpiled separately from other stockpiles to avoid unnecessarily spreading weed propagules into non-infested areas of the site. Equipment used for stripping soil from weed infested areas will be appropriately cleaned to prevent unnecessarily spreading weed propagules into non-infested areas of the site. • Fill material required for construction will be sourced from areas free of noxious or invasive weeds. • Following construction, topsoil will be replaced and seeded as appropriate to limit the establishment of weed populations on the disturbed soil. • Post-construction and post-decommissioning monitoring programs will be implemented to document noxious or prohibited weeds in the PDA, report to landowners or regulatory agencies, and develop management plans in consultation with qualified experts.	•	Upon completion of post-reclamation monitoring		

ID	Commitment	Section in EIS	Condition in Approval	Permit # (if available)	Name and Section of Additional Report	Approving Agency/ Branch	Measure of Compliance	Commitment Status (met, not met, in progress)	Preventative or Corrective Action	Adaptive Action	Commitment Due Date	Actual Completion Date	Comments
9	Avoid or minimize disturbance to wetlands during Project construction and decommissioning	Section 8.4.4.2; Appendix C, Section 3.3.7				Saskatchewan Water Security Agency (WSA)	• All Project activies` are limited to the boundaries of the PDA • Wetland protection measures are implemented during construction and decommissioning. • Appropriate permits (i.e., Aquatic Habitat Protection Permits [AHPP]) are acquired prior to any activities that may result in wetland disturbance.	In progress	• The Project layout has been sited to avoid wetlands where possible. • Wetland boundaries within the PDA will be staked on-site for avoidance during construction. • An Environmental Monitor will be present for activities within or near wetland habitat. • Where wetlands cannot be avoided, an AHPP application will be submitted to the WSA. No disturbance to wetlands will occur without prior regulatory approval. • If required during wet conditions, additional mitigation measures will be implemented, including installation of matting or geotexleą materials, and the use of high surface area, low ground pressure equipment. • Culverts will be installed at designated water crossings to mimic the water movement of pre-disturbance conditions along roads and permanent facilieąs. • Erosion and sediment control measures will be installed as required to direct surface runoff away from wetlands. • All refuelling and maintenance of vehicles and equipment will be conducted a minimum of 100 m from all wetlands.	•	Upon completion of construction and decommissioning activities		

ID	Commitment	Section in EIS	Condition in Approval	Permit # (if available)	Name and Section of Additional Report	Approving Agency/ Branch	Measure of Compliance	Commitment Status (met, not met, in progress)	Preventative or Corrective Action	Adaptive Action	Commitment Due Date	Actual Completion Date	Comments
10	Avoid or minimize loss or degradation of wildlife habitat during Project construction and decommissioning	Section 9.4.2.2; Appendix C, Section 3.3.8				ENV - FWLB and EASB	• All Project activies` are limited to the boundaries of the PDA • Activity restriction setback distances for sensiveą environmental features are maintained for all Project activities, unless previously discussed and authorized by ENV.	In progress	• Vegetation clearing activities in areas of suitable wildlife habitat will be scheduled to occur outside of the primary nesting period (i.e., April 26 to August 15; ECCC 2020a). Where the nesting period cannot be avoided, nesting bird surveys will be completed by a qualified biologist, and appropriate measures implemented should an acve` nest be found (e.g., stop work, apply a setback, etc.), through consultation with ENV. • Sensitive environmental features and their applicable setback distances will be avoided by Project activities, or following the guidance of the Environmental Monitor in the absence of prescribed setback distances. Where work cannot occur without maintaining the applicable setback distance to an environmental feature, ENV will be consulted to discuss potential alternaveą migaǎtion measures (e.g., monitoring species behaviour during construction activieąs, installation of exclusion barriers such as sediment fencing near northern leopard frog habitat, etc.). • Areas of suitable wildlife habitat disturbed by construction activieąs will be promptly reclaimed and revegetated following construcon,` to allow the areas to return to an equivalent land capability. • Where mitigation for direct habitat loss this is not feasible, the option to offset residual effects will be explored to achieve no net loss of wildlife habitat overall (see Appendix C).	•	Upon completion of construction and decommissioning activities		

ID	Commitment	Section in EIS	Condition in Approval	Permit # (if available)	Name and Section of Additional Report	Approving Agency/ Branch	Measure of Compliance	Commitment Status (met, not met, in progress)	Preventative or Corrective Action	Adaptive Action	Commitment Due Date	Actual Completion Date	Comments
11	Minimize effects on wildlife mortality risk resulting from Project construction and decommissioning activities	Section 9.4.3.2; Appendix C, Section 3.3.8				ENV - FWLB and EASB	• All Project activies` are limited to the boundaries of the PDA • Activity restriction setback distances for wildlife SOMC are maintained for all Project activities, unless previously discussed and authorized by ENV.	In progress	• The Project layout has been designed to site components on previously disturbed land cover types (i.e., cropland) as much as possible. • Project activities will be scheduled to occur outside of the primary bird nesting period, and in accordance with applicable activity restriction setbacks. In the event that the prescribed setback distances and/or timing restrictions cannot be adhered to, appropriate responses (e.g., monitoring species behaviour during activities, installation of exclusion barriers such as sediment fencing near northern leopard frog habitat, rescheduling Project activities, etc.) will be implemented through consultation with ENV. • Project-related effects on wildlife mortality risk will also be migaǎted by establishing vehicle speed limits on access roads during construction, operation and maintenance and decommissioning, to reduce the potential of vehicle collisions.	•	Upon completion of construction and decommissioning activities		

ID	Commitment	Section in EIS	Condition in Approval	Permit # (if available)	Name and Section of Additional Report	Approving Agency/ Branch	Measure of Compliance	Commitment Status (met, not met, in progress)	Preventative or Corrective Action	Adaptive Action	Commitment Due Date	Actual Completion Date	Comments
12	Minimize wildlife mortality risk resulting from Project operation and maintenance activities	Section 9.4.3.2; Appendix C, Section 4.2				ENV - FWLB and EASB	• Compliance with the monitoring and reporting requirements outlined in the Adapveą Management Plan (see Appendix C, Section 4)	In progress	• During Project development and sing` sensiveą habitat types that are associated with wildlife SOMCs, such as wetlands and native grassland, were avoided where possible. • Revisions to the Project layout resulted in a reduction from 50 turbines proposed in the Project TPP down to 33 turbines of larger size, which tends to reduce the overall mortality risk of the Project, as larger turbines tend to have lower relative (per MW) mortality rates compared to smaller turbines.	• An Adaptive Management Plan (AMP) has been developed for the Project (see Appendix C, Section 4.0), which is based on guidelines provided by ENV (2018). The AMP includes a post-construction bird and bat mortality monitoring program, which will be implemented for a minimum of two years following commissioning of the Project, and again on the fifth and tenth years of operation. At a minimum, the results of the monitoring program will be reported annually to ENV. • Management triggers established in the AMP are based on bird and bat mortality thresholds, and are structured in a three-ereąd system, in accordance with ENV guidelines (2018). Each tier is defined based on the documented annual fatality levels, the number of fatali. es of wildlife SOMC and occurrence of a significant fatality event (SFE). • If management triggers are met, ENV will be consulted to determine appropriate operaon al miga on measures, which may include: o Increased PCMP repor ng frequency; o Extension of the annual PCMP beyond two years following Project commissioning; o Altering cut-in speed (curtailment); o Feathering of WTG blades; or o Seasonal or temporary shutdown of WTGs.	Throughout Project operation		

ID	Commitment	Section in EIS	Condition in Approval	Permit # (if available)	Name and Section of Additional Report	Approving Agency/ Branch	Measure of Compliance	Commitment Status (met, not met, in progress)	Preventative or Corrective Action	Adaptive Action	Commitment Due Date	Actual Completion Date	Comments
13	Avoid all previously discovered heritage resources in the Project area	Section 10.4.2.2; Appendix C, Section 3.3.9; Appendix J				Saskatchewan Ministry of Parks, Culture and Sport - Heritage Conservation Branch	• All Project acv ies are limited to the boundaries of the PDA • Project acvie s do not interact with known heritage resources	In progress	• The Project layout was sited to avoid all known loca ons of heritage resources, based on the finding from a Heritage Resource Impact Assessment completed for the Project. As such, no known heritage resources are in conflict with the PDA. • Prior to construcon, boundaries of equipment and vehicle travel, and the extents of vegeta on clearing will be clearly marked in nave land cover classes (i.e., undisturbed areas with poten al to encounter heritage resources). • In the event that a previously undiscovered heritage resource is discovered during construcon, work in the area will be suspended and the discovery will be reported to OTW LP and the Environmental Monitor. The HCB will be contacted, and work in the area will not resume unl advised by OTW LP.	•	Upon completion of construction activities		
14	Increase employment opportunities and economic activity for local residents and business	Sections 11.4.2.2 and 11.4.3.2; Appendix K.1 and K.2				N/A	N/A	In progress	• No preventav e or correcve aco ns have been implemented or proposed	•	Throughout Project construction, operation and maintenance and decommissioning		

ID	Commitment	Section in EIS	Condition in Approval	Permit # (if available)	Name and Section of Additional Report	Approving Agency/ Branch	Measure of Compliance	Commitment Status (met, not met, in progress)	Preventative or Corrective Action	Adaptive Action	Commitment Due Date	Actual Completion Date	Comments
15	Avoid or reduce adverse effects on community services and infrastructure by Project activities	Section 12.4.2.2				Saskatchewan Ministry of Highways; Rural Municipalities (RMs) of Happy Valley and Hart Butte	• Appropriate consulta on with community service providers and RM councils • Tracking and addressing public complaints throughout all Project phases	In progress	• Prior to construcon, consult with local service providers, RM councils to coordinate the anci pated increase in demand on local businesses (i.e., accommoda ons, restaurants, commercial goods and service providers), to iden fy and address gaps in capacity. • Develop and implement an ERP for the Project, and coordinate with emergency services (RCMP, local fire departments and Sun Country Health Authority) to address site response procedures. • Should the COVID-19 pandemic be ongoing at the m e of construcon, a pandemic pracce s plan will be established to reduce the risk of crew members becoming infected or transming communicable diseases to residents of the Project area. • Develop a communica on schedule and plan with the RMs to address road condi ons, maintenance and transportao n needs. • Communicate in advance with local residents in the area about traffic restricons and construco n ac vie s to limit disturbance to traffic in the Project area. • Communicate transportaon schedules and road crossings measures with municipal and provincial authori es.	•	Throughout Project construction, operation and maintenance and decommissioning		

ID	Commitment	Section in EIS	Condition in Approval	Permit # (if available)	Name and Section of Additional Report	Approving Agency/ Branch	Measure of Compliance	Commitment Status (met, not met, in progress)	Preventative or Corrective Action	Adaptive Action	Commitment Due Date	Actual Completion Date	Comments
16	Avoid or minimize the potential for accidents, malfunctions or unplanned events to result from Project activities	Section 14.4; Appendix C, Sections 3.3.1, 3.3.2, 3.3.3, 3.3.10, 3.3.11 and 3.3.12				Saskatchewan Ministry of Labour Relations and Workplace Safety	• Establishment of an Emergency Response Plan (ERP) during construcon, operaon and maintenance an decommissioning Establishment of inspecon and monitoring programs to ensure compliance of Project components with applicable standards and BMPs.	In progress	• The Project layout was designed to incorporate appropriate setback distances of WTGs to residences, overhead transmission lines, and public roads. • The WTGs selected for the Project will be rated to withstand the condi ons ancipa ted to be encountered in the Project area, and will be equipped with safety systems to alert opera onal personnel and control opera on in the event of equipment failure or ice accumulaon . • An Environmental Management Plan has been developed for the Project (Appendix C, Secon 3.0), which includes environmental proteco n measures and BMPs that will be implemented to minimize the potenal for accidents, malfunc ons or unplanned events to result from Project acvie s. • A site-specific ERP with defined conng ency and emergency response procedures in the event of a hazardous material spill, fire, vehicle accident or medical emergency will be developed and implemented throughout the construcon, operaon and maintenance and decommissioning phases.	• Site-specific management and response plans will be updated and revised throughout all phases of the Project, based on changes in the biophysical or socio-economic seng in the Project area (e.g., abnormal climate condi ons, unforeseen changes in community services), technological or scien fic advancements in wind energy genera on, and/or results of incident invesgao ns. These updates and revisions will be implemented to connua lly improve prac ces and procedures on the Project, with the objecv e of avoiding or minimizing the poten al health, safety and environmental effects of the Project throughout all of its phases.	Throughout Project construction, operation and maintenance and decommissioning		

Appendix C

Environmental Protection Plan

DILLON CONSULTING

OUTLAW TRAIL WIND LP

Outlaw Trail Wind Energy Project

Environmental Protection Plan

February 2021

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Appendices

1.0 Introduction

Outlaw Trail Wind LP (OWT LP) is developing the Outlaw Trail Wind Energy Project (the Project) to prepare an Environmental Impact Statement (EIS) for the proposed Outlaw Trail Wind Energy Project (the Project), located approximately 20 kilometres east of the Village of Coronach, in south-central Saskatchewan. This Environmental Protection Plan (EPP) has been prepared as part of the Environmental Impact Statement (EIS) for the Project, and is intended to provide an outline of the site-specific mitigation measures, best management practices, and adaptive management approaches to be implemented during the construction and operation and maintenance phases of the Project, as well as an offsetting plan to address residual effects on natural land cover types. This EPP is comprised of the following sections:

- On overview of the regulatory framework, to provide context for the information included in the EPP;
- A high-level description of the Project;
- An Environmental Management Plan (EMP), which is intended to provide practical and clear guidance to contractors and Project personnel with respect to the commitments and mitigaon` measures to be implemented during Project construcon and` operation (including maintenance activies);`
- An Adaptive Management Plan (AMP) for the Project, which is intended to assess the effectiveness of mitigaon efforts` and identify wildlife risks by conducting carcass surveys and wildlife monitoring following commissioning of the Project; and
- An offseng plan,` which is intended to address the residual effects of the Project on natural land cover types that cannot otherwise be addressed through avoidance or implementaon of mitigation strategies.

1.1 Regulatory Framework

1.1.1 Regulatory Requirements and Approvals

The Project may be subject to the federal, provincial, and municipal regulatory requirements and approvals summarized below in Table 1-1.

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Table 1-1: Summary of Regulatory Requirements and Approvals Relevant to the Project

Regulation	Description	Action Required
Federal Regulatory Requirements		
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.	The Project infrastructure is not proposed to interact with waterbodies or watercourses that are fish-bearing.
Migratory Birds Convention Act and Regulations, 1994	Applies to all lands where migratory birds breed and nest and prohibits the disruption or loss of active migratory bird nests. It prohibits the taking of migratory birds, their eggs or nests unless permitted.	Strategies such as timing of construction and pre-construction surveys will be utilized to avoid the disruption or loss of active migratory bird nests. OTW LP will avoid construction clearing on lands suitable for migratory bird nesting or breeding during the breeding and nesting seasons (approximately mid-April to end of August). If avoidance of this period is not possible, qualified biologists will survey all lands subject to clearing and appropriate setback distances prior to any activity to determine if birds are nesting within the Project construction limits. Monitoring of bird mortality as a result of Project operation will be used to determine if adaptive mitigation will be required to reduce bird mortality rates.
Species at Risk Act, 2002 (SARA)	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 of SARA-listed species for infrastructure siting reflect the Activity Restriction Setbacks for Sensitive Species (Saskatchewan Ministry of Environment [ENV] 2017a) to avoid disturbance of SARA-listed species. Monitoring of mortality to SARA-listed species will occur during operation to determine if there are additional mitigation measures required to reduce or avoid impacts to SARA-listed species.

Regulation	Description	Action Required
Transport Canada	Responsible for ensuring proper marking and lighting on tall structures in accordance with Transport Canada's Standard 621.	An Aeronautical Assessment Form for Obstacle Marking and Lighting will be submitted to Transport Canada for their review. Approval will be required prior to construction.
NavCanada	Responsible for issuing approval related to land use in proximity to airports.	A Land Use Submission Form will be submitted to NavCanada for their review. Approval will be required prior to construction.
Saskatchewan Provincial Regulatory Requirements		
The Environmental Assessment Act, 1980	Provides the criteria against which a project is compared by the ENV, to determine if the project is deemed a "development" and will therefore be required to undergo an Environmental Impact Assessment (EIA).	Following OTW LP's submission of a Technical Project Proposal to ENV – Environmental Assessment and Sustainability Branch (EASB), a Ministerial Determination was issued by the ENV – EASB, in which the Project was deemed a "development". Therefore, an EIA has been completed and compiled into an Environmental Impact Statement (EIS), to which this EPP is attached.
Environmental Management and Protection Act, 2010	Provides for the protection of aquatic habitat from development or alterations to waterbodies or watercourses.	Aquatic Habitat Protection Permits (AHPP) will be required for wetlands, streams and water bodies that may be impacted by construction activities.
Heritage Property Act, 1980	Protects and conserves heritage resources on provincial and municipal lands.	A heritage resource impact assessment (HRIA) was conducted on all quarter sections crossed by the Project that were deemed to have high heritage value, and the results were submitted to the Heritage Conservation Branch (HCB).
The Pest Control Act, 1978	Governs the control and destruction of certain pests, as designated by the Saskatchewan Ministry of Agriculture.	Measures will be implemented to control and eradicate pests, as required, during the construction, operation and decommissioning phases of the Project.
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 were documented during the vegetation community surveys and will be forwarded to landowners or land occupants. Additional observations made during rare plant pre-construction surveys will also be provided to landowners or occupants.

Regulation	Description	Action Required
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 were obtained through the Fish and Wildlife Branch of ENV for the 2016, 2017 and 2019 field seasons as per the requirements in those years for field surveys completed. 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 on Crown Land within the agricultural region.	Permitting or crossing agreements may be required for any potential alteration to protected lands. Project infrastructure is not proposed to encounter any WHPA lands.
The Highways and Transportation Act, 1997	Governs the movement of loads that exceed what is normally permitted to travel on provincial roads.	An Overweight and Over-Dimensional Load Permit will be required during construction to allow the movement of trucks carrying heavy equipment and Project components on provincial roads.
Municipal Regulatory Requirements		
The Planning and Development Act, 2007	The Act allows the RMs to address land use and development issues through the adoption of an official community plan and zoning bylaw.	OTW LP has consulted with the Rural Municipalities (RMs) of Hart Butte and Happy Valley to determine the permits required for the Project.

1.1.2 Regulatory Guidance Documents

In addition to the regulatory requirements, the following resources were considered in the preparation of the EPP:

- *Wildlife Siting Guidelines for Saskatchewan Wind Energy Projects* (ENV 2019);
- *Adaptive Management Guidelines for Saskatchewan Wind Energy Projects* (ENV 2018);
- *Saskatchewan Activity Restriction Guidelines for Sensitive Species* (ENV 2017a);
- Identified sensitive areas and features, including biophysical sensitivities (e.g., native prairie and wetlands) and heritage resources;
- Environmental Construction Operations (ECO) Plan Framework (Government of Alberta [GOA] 2017a); and
- *Wildlife Directive for Alberta Wind Energy Projects* (GOA 2017b).

2.0 Project Description

The Project is proposed to have a total generating capacity of up to 200 megawatt (MW) with a maximum of 33 wind turbine generator (WTG) locations and 4 alternative locations. Each WTG will have a nameplate generating capacity of 6.2 MW; the final WTG selection and number of WTGs will be determined at the time of procurement. Other permanent Project infrastructure includes access roads to each WTG, pad-mounted transformers, an above and below-ground electrical collector system, a transformer substation, communications and control system, operation and maintenance building, up to two meteorological (MET) towers and other ancillary equipment. The proposed Project Development Area (PDA) encompasses approximately 182.5 hectares (ha), however, only 25.1 ha are expected to be occupied by permanent infrastructure. Of the 182.5 ha PDA, 157.5 ha will have light and temporary disturbance as temporary construction area.

2.1 Proposed Project Construction Schedule

The Project is comprised of four phases: development, construction, operations and maintenance and decommissioning.

The Project is currently in the development phase, which includes facility interconnection planning with SaskPower, completion of environmental studies and preparation of permit and approval applications, stakeholder engagement, Project design and engineering, equipment procurement and Project financing.

Construction will begin when all stages of the development phase have been completed and will be dependent on selection of the Project by SaskPower, SaskPower's interconnection line, regulatory approvals, equipment supply and the seasonal conditions. However, the approximate schedule for Project activities is provided in Table 2-1.

Table 2-1: Schedule and Project Milestones

Milestone	Anticipated Project Schedule
Construction	June, 2022 to November, 2023
Commissioning	December, 2023
Operation	December 2023 to 2048
Decommissioning	2048 to 2049

3.0 Environmental Management Plan

The EMP is intended to provide practical and clear guidance to contractors and Project personnel on the environmental constraints and measures to mitigate potential effects to the environment during Project construction and operation (including maintenance activities). This EMP provides a framework to assess, track and document the Project's environmental compliance requirements as a means of managing environmental risk. The mitigation measures and setback distances for sensitive environmental features included in the EMP are based on the Saskatchewan Activity Restriction Guidelines for Sensitive Species (ENV 2017a), other applicable regulations and guidance and industry best practices. These mitigation measures were also accounted for in the assessment of effects of the Project on Valuable Ecosystem Components (VECs) included in the EIS.

3.1 Siting and Pre-Construction Environmental Assessment

The PDA is defined as the area comprising the Project footprint, which is the anticipated maximum area of physical disturbance associated with the construction and operation phases of the Project. The PDA includes the temporary (i.e., during construction) and permanent areas of physical disturbance. During the initial siting of a project, important or sensitive environmental features can be avoided by the project components, which may significantly reduce the need for further mitigation measures (ENV 2019). Once the initial Project siting was completed, information on the existing environmental conditions was collected, focusing on selected VECs, to facilitate the completion of an environmental assessment of the potential effects of the Project on the environment.

Information on the existing environmental conditions was obtained from desktop reviews of available sources (including scientific literature, online databases and aerial imagery), biophysical field studies (completed in 2015, 2016, 2017, and 2019), and subsequent data analyses. Refer to the applicable sections of the EIS, to which this EPP has been attached, for detailed information on the desktop reviews, field studies, and data analyses.

The sensitive environmental features that were identified in association with the PDA, as well as the applicable activity restriction setbacks as defined in the Saskatchewan Activity Restriction Guidelines for Sensitive Species (ENV 2017a), are outlined in Table 3-1.

Table 3-1: Sensitive Environmental Features Identified in the Project Development Area

Sensitive Environmental Features		Applicable Restricted Activity Period[1]	Applicable Setback Distance for Renewable Energy Projects[1]	Number of Features or Area (ha) of Features Identified in PDA[2]
Scientific Name	Common Name			
Plant Species of Management Concern				
Echinacea angustifolia var. angustifolia	narrow-leaved purple coneflower	Year round	30 m	1
Hymenopappus filifolius var. polycephalus	tufted hymenopappus	Year round	30 m	5
Mertensia lanceolata var. lanceolata	prairie bluebells	Year round	30 m	2
Orobanche ludoviciana	Louisiana broom-rape	Year round	30 m	2
Paronychia sessiliflora	low whitlowwort	Year round	30 m	7
Phlox alyssifolia ssp. alyssifolia	blue wild phlox	Year round	30 m	13
Physaria spatulata	spatulated bladderpod	Year round	30 m	3
Polygala alba	white milkwort	Year round	30 m	6
Potentilla concinna var. concinna[3]	early cinquefoil	Year round	30 m	Unknown
Potentilla lasiodonta	sandhills cinquefoil	Year round	30 m	4
Wildlife-Specific Sensitive Environmental Features				
Lithobates pipiens	northern leopard frog	Year round	500 m; breeding ponds	5
Buteo regalis	ferruginous hawk	March 15 – July 15	1,000 m; nests	1
Tympanuchus phasianellus	sharp-tailed grouse	March 15 – May 15	400 m; lek sites	4

Note: [1]Source: Saskatchewan Activity Restriction Guidelines for Sensitive Species (ENV 2017a).

[2]Including overlap of applicable activity setback distance.

[3]Potentilla concinna var. concinna was observed during the 2016 vegetation community surveys; however, it was not identified as a plant SOMC at the time, it the location(s) of the observations were not documented. The SK CDC updated the provincial rank of this species on April 26, 2016.

The majority of the PDA is comprised of cultivated land, accounting for 71.9% of the total area of the PDA. Sensitive land cover types, including native grassland, wetlands, and broadleaf (i.e., trees over 10 m tall) cover, occupy lesser portions of the PDA, as presented below in Table 3-2.

Table 3-2: Land Cover Classes within the Project Development Area

Land Cover Class	Proportion of PDA[1]	
	Area (ha)	Proportion (%)
Broadleaf	0.3	0.2%
Cropland	131.2	71.9%
Developed	14.1	7.7%
Drainage	0.1	0.0%
Grassland	8.3	4.5%
Pasture/Forage	27.9	15.3%
Shrubland	0.1	0.0%
Wetlands	0.7	0.4%
Total	182.5	100.0%

NOTE: [1]Land cover metrics are based on desktop mapping.

The potential effects of the Project on the environment, including the sensitive environmental features identified above, have been identified and assessed, and mitigation measures have been proposed during the environmental assessment of the Project, as described in the EIS.

3.2 Project Roles and Responsibilities

OTW LP – Owner

As the owner and operator of the Project, OTW LP is ultimately responsible for the Project schedule, scope and budget. OTW LP's Project Management team will be responsible for ensuring that all construction and operations activities will meet the relevant federal, provincial and municipal regulatory requirements, as well as OTW LP's established construction standards.

Environmental Monitor

OTW LP will retain the services of a qualified Environmental Monitor during Project construction. The Environmental Monitor will be responsible for the following tasks:

- Monitoring construction activies to` ensure compliance with regulatory requirements and that the EPP commitments are being followed;
- Review management and mitigation plans regularly and recommend updates as required;
- Ensure that environmental concerns are appropriately documented;
- Report any non-compliance to OTW LP personnel, and work with the Contractor to correct the non-compliance;
- Conduct regular site inspections to identify environmental issues (e.g., noxious weed infestations, excessive disturbance to soil and/or vegetation communities, wildlife concerns),

and work with OTW LP personnel and the Contractor to implement appropriate correcve acons;

- Record any corrective actions and track them to completion; and
- Provide guidance and recommendations during reclamation of disturbed areas once construcon of the permanent wind energy infrastructure is complete, with the objective to return the Project Site to an equivalent land capability upon decommissioning.

Construction Contractor

OTW LP will hire a qualified Construction Contractor to construct the Project in accordance with industry standards, regulatory guidelines, and Project design. The Construction Contractor's Project Manager will oversee the execution of construction activities, and will ensure that all necessary licences and approvals are obtained prior to the commencement of construction. The Construction Contractor's Project Manager will be responsible to ensure that the environmental protection measures included in the EPP are implemented, and will work with OTW LP and the Environmental Monitor to appropriately address any areas of non-compliance.

3.3 Environmental Protection Measures

The environmental protection measures and best management practices provided in the following sections will be implemented during the construction and/or operation phases of the Project to eliminate or mitigate the potential effects to the environment.

3.3.1 Vehicle and Equipment Operation

- Vehicles and equipment will be used throughout the construction phase for transport personnel and materials and to complete various construction activities throughout the PDA. Similarly, vehicles and equipment will be used throughout the operation phase of the Project; however, the frequency of use will be considerably lower. The following environmental protecon measures or procedures specific to vehicle and equipment use will be implemented during the construction and operation phases:
- All vehicles and equipment will arrive on-site in a clean and well-maintained condition, and will be free of leaks, oil and grease residue, soil clods and vegetative debris and propagules;
- Vehicles and equipment will be regularly inspected, appropriately maintained, and safely operated at all times;
- All vehicles and equipment will be equipped with spill response materials and firefighting equipment while on-site; and
- Vehicle and equipment idling will be reduced to the extent feasible.

3.3.2 Project Access and Traffic Management

The environmental protection measures will be implemented to manage access to the PDA and Project-related traffic:

- Access roads will be sited on established roads and trails to the extent possible, to reduce the area of new disturbance required for Project construction and operation;
- Access to the PDA during construction will be limited to authorized personnel only (i.e., OTW LP personnel or their approved representatives and contractors);
- Landowners and lessees of lands within the PDA will be contacted prior to commencing construcon aàctivities on their lands;
- Mul-passenger vehicles will be` used to the extent feasible for transportation of personnel to reduce vehicle and equipment congestion;
- Project vehicles and equipment will be restricted to designated travel areas within the PDA; Project access and egress locations will be idenfied` in the Site Plan developed by the contractor;
- Speed limits will be implemented along project traffic areas for Project personnel as appropriate, including provincial roads and Project access roads, to minimize disturbance to local residents and businesses;
- Appropriate signage will be posted to identify designated traffic routes and speed limits;
- Dust control measures will be implemented as required during construction, such as spraying dust suppressant on roadways;
- Construcon and` equipment noise will be limited to the hours of 7:00 am to 10:00 pm;
- No vehicles or equipment will be parked on public or RM roadways or adjacent private property without proper consent; and
- Project personnel will work with the RMs of Hart Bueą and Happy Valley and local law enforcement in the development of the traffic management plan during construction.

3.3.3 Prohibited Activities

The following activities will be prohibited by Project personnel, contractors and site visitors within the PDA:

- Use or carrying of firearms;
- Hunting;
- Harassing or feeding wildlife;
- Littering;
- Bringing pets on-site;
- Use of recreational vehicles;

- Smoking outside of designated areas;
- Burning waste; and
- Alcohol and drug use.

3.3.4 Soil Management

During construction, soil disturbance will be limited to the extents required for the installation of Project infrastructure. Where soil disturbance is required, the following soil management measures will be implemented:

- Construction activities will be halted during extreme weather events (e.g., heavy precipitaon)` to avoid rutting and compaction that could lead to topsoil loss or erosion;
- Disturbance to areas of sensitive terrain and soil features within the PDA (e.g., steep slopes, sandy blowouts or other eroded areas) will be avoided where possible;
- The boundaries of vegetation clearing will be staked or otherwise marked to limit construcon` disturbance beyond these areas;
- Topsoil will be salvaged and stored separately on undisturbed lands within the PDA, to prevent soil admixing and maintain soil integrity;
- A three-lift process will be used when grading or excavating as appropriate (e.g., saline soils) to salvage subsoil horizons separately and preserve soil quality;
- Where grading is required, subsoil will be stockpiled on areas where topsoil has been previously removed, or on stable barriers (e.g., mang,` geosynthetic material) to prevent soil admixing;
- Graded areas will be re-contoured to a stable profile to limit the potential for erosion and sediment transportation;
- Soil stockpiles left for longer than 30 days should be covered or stabilized by seeding, mulching, or equivalent means;
- Soil stockpiles will be placed outside of areas of natural surface drainage patterns to avoid erosion and sediment transportation;
- Appropriate erosion and sediment control measures (e.g., sediment fencing, check dams, matting) will be implemented to prevent sediment transfer from construcon` areas into undisturbed areas;
- Following construction, graded non-operaonal areas of the Project Site will be contoured to a stable surface profile that is consistent with natural drainage patterns;
- During post-construction reclamation, soil compacon` can be alleviated by deep ploughing subsoils prior to replacement of salvaged topsoil; and
- Salvaged topsoil will be replaced on stripped areas with minimal soil handling to maintain soil integrity and prevent admixing.

3.3.5 Erosion and Sediment Control

The Construction Contractor is responsible for installing temporary erosion and sediment control measures, as required, to mitigate soil loss due to Project activities. Implementation of erosion and sediment control measures will follow best management practices, including the following:

- Erosion and sediment control measures will installed under the supervision of the Environmental Monitor or otherwise qualified personnel;
- Installed erosion and sediment control measures will be regularly inspected to monitor its efficacy, particularly following a heavy or prolonged rainfall event, and maintained as required. A heavy event is typically defined as greater that 12 millimetres (mm) of rain during a 24-hour period. If construcon` continues over the winter season, the installed erosion and sediment control measures will be inspected aer a` heavy snowmelt period. In the event of a work stoppage, the Construction Contractor will maintain responsibility for the inspection and maintenance of erosion and sediment control measures;
- Inspection reports and photographs will be used to monitor erosion and sediment control measures, and copies will be made available to personnel on-site;
- If work areas require dewatering to facilitate construcon,` the water will be inspected prior to pumping to ensure it is acceptable to discharge (e.g., no visible hydrocarbon sheen or odour), and an acceptable discharge locaon` will be selected where the potential for water erosion can be minimized (e.g., well-vegetated area or a lined dewatering cell), and discharged water will not enter wetland habitat;
- Construction activities will be halted during extreme weather events (e.g., heavy precipitaon)` to avoid rutting and compaction that could lead to topsoil loss or erosion;
- Topsoil handling will be suspended during high winds when soil erosion is evident and during heavy rains, if soil becomes saturated. Topsoil will not be handled until winds have decreased, and/or topsoil has drained and dried;
- Where damaged or ineffecve erosion` and sediment control measures are identified, they will be promptly communicated to the Construcon` Contractor and corrective actions will be implemented; and
- Upon completion of the construcon phase, and once the PDA has been stabilized, sediment fencing, check dams and other erosion control measures will be removed from the Project.

3.3.6 Vegetation Management

As discussed in Section 3.1 of the EPP, the majority of the PDA is comprised of cultivated land, accounting for 71.9% of the total area. However, sensitive land cover types (i.e., grassland, wetland, and broadleaf land cover types) are also encountered within the PDA, collectively accounting for 5.1% of the total area. Additionally, ten plant species of management concern (SOMC) were identified within their 30 m setback distance the PDA. To mitigate the potential effects of the Project on vegetation within and surrounding the PDA, particularly the above noted sensitive features, the following environmental protection measures will be implemented:

- Sensitive environmental land cover types, including naveą grassland, wetlands, and broadleaf cover, have been avoided to the extent possible during the Project design;
- The previously idenfied` occurrences of plant SOMC and their applicable setback distances (ENV 2017a) have been avoided where feasible during Project layout design;
- Direct effects on plant SOMC will be further reduced during construcon` by micro-siting Project components and boundaries for Project activies to` avoid naveą land covers classes and maintain a 30 m setback distance from plant SOMC to the extent feasible;
- In the event that avoidance of all identified plant SOMC in the PDA is not feasible, OTW LP will contact ENV and discuss appropriate mitigation measures to reduce the potenal effeącts of the Project on the specific SOMC occurrences (e.g., schedule activities outside of the growing season, placement of matting or other protective barriers over the plant populations);
- In the event that previously unidentified plant SOMC are found during construction, appropriate site-specific mitigation measures will be implemented, following discussions between OTW LP, the Environmental Monitor, and ENV;
- An environmental monitor will be present during construcon and` reclamation activities in the vicinity of documented plant SOMC and will inspect areas of the PDA located on naveą land cover classes prior to construction to identify and stake plant SOMC populations and applicable setbacks for avoidance, as required;
- Known locaons` of plant SOMC within the PDA will be staked or otherwise marked for avoidance prior to construction;
- Construction activities on naveą prairie will be restricted to dry or frozen ground conditions, and traffic will be limited to the fewest practical number of vehicles and equipment;
- All vehicles and equipment will arrive to the Project free of soil and vegetave debris and` propagules, to mitigate the potential for the introducon of invasive weeds;
- Prior to construction, the PDA will be inspected for noxious or prohibited weeds, as designated under the *Weed Control Act* (Government of Saskatchewan [GOS] 2010b). Where identified, areas of weed infestation will be documented, marked on-site, communicated to on-site Project personnel, and avoided where possible;
- Where avoidance of areas of weed infestaon is not` possible, topsoil stripped from infested areas will be salvaged and stockpiled separately from other stockpiles to avoid unnecessarily spreading weed propagules into non-infested areas of the site;
- Equipment used for stripping soil from areas of known noxious weed infestaon` should be diligently cleaned with hand tools (i.e., shovels, brooms), compressed air, or using a dedicated wash station, as appropriate, to prevent unnecessarily spreading weed propagules into non-infested areas of the site;

- Aggregate or other fill material required for construction will be sourced from areas free of noxious or invasive weeds;
- Access matting or other similar barriers will be used in areas of weed infestation that cannot be avoided by vehicle or equipment traffic, as appropriate, to limit the spread of infestation;
- Weed growth on stockpiled topsoil will be monitored during the course of construcon,` and mitigation measures (e.g., spraying) will be conducted as appropriate;
- Following construction, topsoil will be replaced and seeded as appropriate to limit the establishment of weed populations on the disturbed soil;
- Where seeding will be required during reclamation (e.g., grassland, pasture/forage lands), only Certified Canada No. 1 seed may be used, with the Cerficates` of Analysis retained for documentaon;` and
- The PDA will be inspected for the presence of noxious or prohibited weeds throughout construction and operation of the Project. In the event that, despite best management practices, weeds are inadvertently introduced to the PDA during construction or operation, Project personnel will immediately remove them through standard management pracces.` Weed control by mechanical (i.e., mowing, hand-pulling) or chemical (i.e., spraying) treatment will be undertaken as required. Chemical treatment will be completed by provincially licensed personnel approved by OTW LP.

3.3.7 Wetland and Watercourse Mitigation

As previously discussed, avoidance of wetlands was considered in the Project layout design. However, 26 wetlands and 5 drainages are encountered by the PDA, accounting for approximately 0.4% of the PDA area. To mitigate the potential effects of the Project on wetlands and watercourses, the following environmental protection measures will be implemented during the construction and/or operation phases:

- Project components, including access roads, temporary workspaces and collector lines, will be sited to avoid wetlands and watercourses, where possible;
- Prior to construcon,` wetland and watercourse boundaries within the PDA will be staked or otherwise marked on-site with appropriate buffers, for avoidance during construction;
- Where collector lines cannot be re-routed to avoid wetlands or watercourses, they will be avoided using horizontal direconaàl drilling installation (for underground collector lines) or spanning across the wetland (for overhead collector lines);
- In the event that wetland or watercourse habitat cannot be avoided by construcon aàctivies,` OTW LP will submit an Aquatic Habitat Protection Permit applicaon` to the Saskatchewan Water Security Agency, in which site-specific measures will be described to mitigate disturbance to wetland or watercourse habitat. No disturbance to wetlands or watercourses will occur without prior regulatory approval;

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- Work near wetlands and watercourses will be completed under dry or frozen condions to reduce the potenal for excess disturbance to the soil and vegetation conditions;
- If work is required during wet conditions, additional mitigation measures will be implemented to avoid soil compaction and admixing, including installaon of matting or geotextile materials, and the use of high surface area, low ground pressure equipment;
- Culverts will be installed at designated water crossings to mimic the water movement of pre-disturbance conditions along roads and permanent facilities;
- An Environmental Monitor will be present for construction activies within or near wetland or watercourse habitat;
- Any disturbance to wetland or watercourse habitat (e.g., rung, compaction) will be promptly repaired and documented by the Environmental Monitor, and will be monitored to ensure successful natural recovery;
- Erosion and sediment control measures will be installed as required to direct surface runoff away from wetlands and watercourses;
- All vehicles and equipment working in wetland or watercourse habitat will be cleaned and inspected for leaks or hydrocarbon residue prior to entering work areas; and
- All refuelling and maintenance of vehicles and equipment will be conducted a minimum of 100 m from all wetlands and watercourses.

3.3.8 Wildlife Management

As discussed in Section 3.1 of the EPP, the majority of the PDA is comprised of cultivated land, which is not considered to provide suitable habitat for wildlife species. However, ten wildlife-specific sensitive environmental features or their applicable setback distances (ENV 2017a) were identified within the Project study area, including five breeding northern leopard frog (*Lithobates pipiens*) breeding ponds, four sharp-tailed grouse (*Tympanuchus phasianellus*) lek sites, and one ferruginous hawk (*Buteo regalis*) nest location. Additionally, the PDA encounters land cover types that are considered to be suitable for wildlife habitat, including native grassland, wetlands and drainages and broadleaf cover.

The following environmental protection measures will be implemented to mitigate potential effects to wildlife and wildlife habitat during construction and operation of the Project:

- The general nesting period for the region occurs from mid-April to late-August for breeding birds (Environment and Climate Change Canada 2018). Construcon and maintenance activies will be scheduled to occur outside of this period where feasible to reduce the potential risk to breeding birds. Where these activities are necessary within the nesting period, a nest search by a qualified biologist will be undertaken and appropriate measures implemented should an active nest be found (e.g., stop work, apply a setback, etc.) ;
- During the construcon and operaon phases, observaons of wildlife, including nests or dens, will be reported to OTW LP or the Construction Contractor;

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- In the event that injured wildlife are observed, the Environmental Monitor or Project personnel will determine if it is mobile or not. If the wildlife species is mobile, no attempt to capture will be undertaken and an appropriate setback will be provided for a period of 24 hours. After 24 hours, if the wildlife appears to be immobile or dead, a local wildlife rehabilitaon group will be` called to assist with appropriately handling the wildlife species and its rehabilitation. Following that procedure, the Environmental Monitor or Project personnel will assess the condition of the site to determine if the cause of the injury or death was potentially a result of Project infrastructure and/or activities. If appropriate, measures will be implemented to remove the cause of the injury or death or, at a minimum, reduce the potenal for injury or` death to occur again;
- In the event that a SARA-listed species is observed dead or injured, the Environment and Climate Change Canada will be informed within 24 hours;
- Exclusion fences will be used to prevent wildlife entering work areas, and will follow best pracces` and strategies while meeting municipal and provincial safety requirements for electricity generating facilities, as appropriate;
- If sensitive or protected species are found to occur within the Project boundaries, appropriate setback distances will be applied in accordance with the *Saskatchewan Activity Restriction Guidelines* (ENV 2017a), or following the guidance of the Environmental Monitor in the absence of formal setback distances;
- Where work cannot occur without maintaining the applicable setback distance to an environmental feature, the ENV will be consulted to discuss potential alternative mitigaon` measures (e.g., monitoring species behaviour during construction activities, installaon of exclusion barriers such as sediment fencing near northern leopard frog habitat, etc.);
- Feeding or harassing wildlife will be prohibited;
- Travel within posted speed limits and yield to wildlife; and
- Areas of suitable wildlife habitat disturbed by construction activities will be promptly reclaimed and revegetated following construction, to allow the areas to return to an equivalent land capability.

3.3.9 Heritage Resources

As discussed in the EIS, a Heritage Resource Impact Assessment (HRIA) was conducted on lands within the PDA that were deemed heritage sensitive by the Heritage Conservation Branch (HCB). The initial HRIA identified two archaeological sites in conflict with the collector line routes; however, the Project layout was subsequently revised, and these sites were avoided by the PDA. The following environmental protection measures will be implemented to mitigate potential effects to heritage resources during construction and operation of the Project:

- Boundaries of equipment and vehicle travel, and the extents of vegetation clearing will be clearly marked in native land cover classes (i.e., undisturbed areas with potential to encounter heritage resources) prior to construction; no disturbance will be permied in areas beyond` these boundaries; and

- In the event that a previously undiscovered artifact or feature is encountered during construction, work in the area will be suspended and the discovery will be reported to OTW LP and the environmental monitor. The HCB will be contacted, and work in the area will not resume until advised by OTW LP.

3.3.10 Material Handling and Storage

The following material handling and storage procedures will be followed by Project personnel, in addition to other measures, as directed by the Construction Contractor:

- All potenàlly hazardous materials will be stored in appropriate containers and handled in designated locations on-site (e.g., site laydown yard), in accordance to applicable legislaon` and permit requirements;
- All fuels will be stored, and refuelling and maintenance of vehicles and equipment will be conducted a minimum of 100 m from all wetlands and watercourses;
- Hazardous materials will be appropriately labelled in accordance with Workplace Hazardous Materials Informaon` System (WHMIS) legislation;
- Material storage areas will be regularly inspected by the Construcon` Contractor and Environmental Monitor to ensure that containers are secure and potential spills and leaks are mitigated;
- A sewage hauling company will service on-site wash trailer facilies and` portable toilets regularly, and wastes will be disposed of at an appropriate facility;
- All Project personnel will practice good housekeeping at times, including daily clean-up of debris within and near the PDA; and
- When transporting or shipping hazardous materials or waste, proper labelling will be used in accordance with Transportaon` of Dangerous Goods (TDG) requirements.

3.3.11 Waste Management

The following waste management procedures will be followed by Project personnel during construction, in addition to other measures, as directed by the Construction Contractor:

- All domesc and` construction waste will be stored temporarily at the laydown yard in appropriate containers and regularly removed from the PDA for disposal at an approved landfill;
- Waste will be segregated into separate streams, such as cardboard, metals, wood, non-hazardous household waste, and placed into separate containers;
- Waste materials will be recycled, where praccal;` and
- All hazardous waste (e.g., oil filters, waste fluids or chemicals) will be removed from the PDA and taken to an approved hazardous waste disposal facility.

3.3.12 Spill Response

OTW LP is committed to reducing or avoiding adverse environmental effects throughout the construction and operations phases of the Project, and to monitoring and evaluating the performance of mitigation measures. As such, all spills are to be reported to the Environmental Monitor, reported to the regulator (as required under the Environmental Management and Protection Act [GOS 2010a]), and remediated by the responsible parties.

All spills will be reported internally to the Environmental Monitor regardless of the location, quantity, or substance released. The Environmental Monitor will determine the appropriate reporting requirements in accordance with provincial and federal spill reporting requirements. The Construction Contractor must have a spill reporting form that meets the minimum requirements of OTW LP, and that contain at a minimum the information requirements of the 30 day Written Spill Report Form of ENV (Appendix A).

Effects from small spills can generally be minimized if appropriate actions are promptly implemented. The Construction Contractor will be responsible for the following:

- Implement and maintain a site-specific Emergency Response Plan (ERP) with the local municipal authorities prior to commencing construcon` activities. The ERP will include spill and release events, and incident reporting requirements;
- Report on construction progress and environmental issues to OTW LP;
- The Environmental Monitor will have the authority to stop an activity that is non-compliant with the EPP through consultation with OTW LP, when needed;
- Report all on-site and off-site spills related to the Project to the Environmental Monitor, regardless of the size. Report spills to the regulator, where required, and in accordance with the *Environmental Management and Protection Act* (GOS 2010a);
- Secure the scene, if required;
- Assess the incident and the resulting potential environmental impact, and investigate the cause;
- Clean up all on-site and off-site spills, regardless of size. Remediate all impacted sites to meet Tier 1 endpoints, as described in the Saskatchewan Environmental Code, Chapter B.1.3 – Correcveạ Action Plan (ENV 2015);
- Implement ERP procedures, if required;
- Record the incident, including photographs, as needed; and
- Implement and document any corrective actions resulting from any spills.

3.3.12.1 Spill Reporting

Report spills and releases to the 24 hour Energy and Environmental Response Line at:
1-800-667-7525

Contractors that release, that cause or permit the release, or that have control of the substance released are responsible for the reporting in accordance with the Discharge and Discovery Reporting Standards of the Saskatchewan Environmental Code (the Standard; ENV 2017b). Landowners or stakeholders will also be notified for any release that occurs outside of the PDA, migrates off the PDA, or occurs on an existing easement or right-of-way within the PDA.

3.3.12.2 TDG Reportable Spills

If a dangerous good is accidentally released from a means of containment (e.g., while loading, unloading, or while in transport via truck), and the amount is over the threshold listed in the Standard, the person who has "the charge, management, or control" of the dangerous good at the time of the release must immediately report the accidental release to:

- The police and provincial authority at 1-800-667-7525;
- The person's employer;
- The consignor of the dangerous goods;
- For a road vehicle, the owner, lessee or charterer of the road vehicle; and/or
- For Class I, Explosives, and Class 6.2, Infectious Substances, and for an accidental release from a cylinder that has suffered a catastrophic failure, CANUTEC at 613-996-6666.

The immediate TDG report must include as much of the following information as is known at the time of the report, as applicable:

- The shipping name or UN number of the dangerous goods;
- The quanty of dangerous goods that:
  - Was in the means of containment before the accidental release, the "dangerous goods accident" or the "dangerous goods incident"; and
  - Is known or suspected to have been released.
- A descripon of the condition of the means of containment;
- The locaon of the` accidental release;
- The number of deaths and injuries resulting from the accidental release; and
- An estimate of the number of people evacuated from private residences, public areas or public buildings as a result of the accidental release.

A follow-up report must be made by the employer of the person who had possession of the dangerous goods at the time of the accidental release. The follow-up report must be made, in writing, to the Director General within 30 days after the occurrence of the accidental release, and include the following information:

- The name and address of the place of business of the person providing the informaon and` telephone number;

- The date, meą and locaon of the accidental release;
- The name and address of the place of business of the consignor;
- The classificaon of dangerous goods;
- The estimated quanty of dangerous goods released and the total quanty of dangerous goods` in the means of containment before the accidental release;
- A descripon of the means of containment involved based on the identification markings and a descripon of the failure or damage to the means of containment, including how the failure or damage occurred;
- For an accidental release from a cylinder that has suffered a catastrophic failure, the certification safety marks and a description of the failure;
- The number of deaths and injuries resulting from the accidental release;
- An estimate of the number of people evacuated from private residences, public areas or public buildings; and
- If an emergency response assistance plan was acvaà ted, the name of the person who responded to the emergency in accordance with the emergency response assistance plan.

4.0 Adaptive Management Plan

As described in the EIS, OTW LP is committed to implementing a post-construction monitoring program (PCMP) to assess the effectiveness of the environmental protection measures described in the EMP (see Section 3.0 of the EPP), and monitor Project operation to gain knowledge of the environmental effects of the Project, from which adaptive management decisions can be made to improve practices and reduce or eliminate these adverse effects.

This AMP has been prepared for the Project to describe the components of the PCMP, including the proposed methods, analyses, reporting requirements, and mitigation strategies. It has been developed based on the ENV's Adaptive Management Guidelines for Saskatchewan Wind Energy Projects (AM Guidelines; ENV 2018).

4.1 Purpose of Adaptive Management

The adaptive management process uses a systematic, science-based approach, where the knowledge gained from monitoring the outcomes of management decisions is used to inform future management decisions, with the objectives of:

- Reducing scientific uncertainties of the potential effects of a project on the selected VECs during development and operaon;`
- Understanding site-specific conditions and, if necessary, developing site-specific migaà on` measures; and
- Continually improving regulatory policies and management pracces` for a specific project, region or industry.

For the Outlaw Trail Project, the adaptive management process began with the initial conceptual planning of the Project, and systematically progressed through to the preparation of the EIS, following the steps outlined below:

1. Selection of a general Project location, in which the high-level sensitive environmental features are avoided, based on Wildlife Siting Guidelines for Saskatchewan Wind Energy Projects (ENV 2019).
2. A desktop environmental constraints analysis and fatal flaw assessment were completed for the general Project location, in which existing data sources were consulted to provide additional information on the sensitive environmental features that may be affected by the Project. This information was used for further planning and design of the Project layout, and included, though was not limited to:
    - Land cover types (e.g., cultivated land, native prairie, wetlands, etc.);
    - Historical occurrences of vegetaon and` wildlife SOMC; and
    - Designated environmentally sensitive lands (e.g., private conservaon easements,` lands designated under the Fish and Wildlife Development Fund).

3. Completion of environmental field surveys to collect detailed information on the existing environmental setting in which the Project was proposed, with specific focus in the selected VECs.
4. Completion of an engagement program with regulatory agencies, stakeholders, and the general public, to inform these parties on the Project details and collect information on their issues and concerns for consideration.
5. Preparation of an EIS, using the information collected through the previous steps, to assess and determine the significance of the potential effects of the Project on the selected VECs.

The information collected from the PCMP is critical to the AMP, in that it will be used to inform and make adjustments to future management plans, determine the need for site-specific mitigation measures to comply with established management triggers, and contribute to better understanding the potential effects of the wind energy industry on the environment.

4.2 Post-Construction Monitoring Program

There is potential for wildlife mortality at operational wind energy projects. Wildlife mortality may occur due to collisions with WTGs, barotrauma from turbine blade air pressure, or natural sources (i.e. natural mortality due to other sources such as predators or adverse weather events).

The PCMP has been developed to collect data on wildlife mortalities in association with collisions with WTGs and barotrauma for bats, and assumes that all mortality within the area searched is conservatively attributed to the wind energy project, while incidental carcass observations outside the search area are considered natural mortality. This data collected will be used to determine estimated fatality levels, the resulting management triggers to be implemented for the Project based on these fatality levels, and whether operational mitigation measures may be required.

The PCMP is comprised of three components: carcass searches, searcher efficiency trials and carcass persistence trials. The latter two components are required in estimation models to correct the fatality estimates by accounting for scavenged carcasses or those missed during the carcass searches. The protocols proposed for these components are based on those provided in the AM Guidelines, and supported by the methods included in the Wildlife Directive for Alberta Wind Energy Projects (GOA 2017b) and Post-Construction Survey Protocols for Wind and Solar Energy Projects (Alberta Environment and Parks 2020).

4.2.1 Management Triggers

Management triggers based on mortality thresholds are used in most Canadian jurisdictions to identify and evaluate mitigation requirements for operating wind energy projects. The AM Guidelines identify a similar results-based approach, in which management triggers are structured in a three-tiered system. Each tier is defined based on the documented fatality levels of bird and bat species, including the number of annual non-listed bird and bat fatalities per MW (corrected with a fatality estimator, as discussed below), the number of fatalities of federally or provincially listed wildlife species, and the occurrence of a significant fatality event (SFE). The fatality levels, reporting requirements and risk-based management responses for each tier are provided below in Figure 1.

Figure 1: Management Triggers for Bird and Bat Fatality at WEPs in Saskatchewan (from AM Guidelines; Appendix A [ENV 2018])

<table>
<tr><th></th><th>Tier 1</th><th>Tier 2</th><th>Tier 3</th></tr>
<tr><td>Fatality Levels</td>
<td>Fatality per megawatt annually with estimator:
• < 4 non-listed birds;
• < 0.1 non-listed raptors; or
• < 2 non listed bats.</td>
<td>Fatality of any wildlife species designated as Special Concern under the Species At Risk Act and any provincially-tracked species ranked S3, S3B or S3M[1,2].

Fatality per megawatt annually with estimator:
• 4 - 6 non-listed birds;
• 0.1 - 0.2 non-listed raptors; or
• 2 – 4 non-listed bats.</td>
<td><u>Annual Limits</u>
Fatality of any wildlife species designated as Threatened or Endangered under the Species At Risk Act or any provincially tracked species ranked S1, S1B, S1M, S2, S2B, or S2M[1,2].
Fatality per megawatt annually with estimator:
• > 6 non-listed bird species;
• > 0.2 non-listed raptors; or
• > 4 non-listed bats.

<u>Significant Fatality Events</u>
Observed fatality:
• ≥ 33 birds in a single monitoring event;
• ≥ 10 birds at a single turbine in a single monitoring event;
• ≥ 33 bats in a single monitoring event; or
• ≥ 10 bats at a single turbine in a single monitoring event</td></tr>
<tr><td>Reporting</td>
<td>• Annual reporting for each year monitoring is required.</td>
<td>• Cause-and-effect analysis (CEA) to be conducted and included in annual report.
• Annual reporting for each year monitoring is required.</td>
<td>• Initial reporting of fatality conditions within 24 hours of observation or next business day for Significant Fatality Events.
• CEA to be conducted and reported within 60 days.
• Annual reporting for each year monitoring is required.</td></tr>
<tr><td>Management Response</td>
<td>• Standard fatality monitoring requirements.
• If continued very low/nil fatality, there is potential for reduced frequency and/or discontinued monitoring program.
• Ongoing fatality detection throughout operations phase.</td>
<td colspan="2">Required mitigation would be determined on a case-by-case basis in consultation with the proponent and depend on results of CEA. Increasing scale and severity of fatality conditions will require commensurate level of mitigation applied.

• Increased reporting frequency
• Extended monitoring program beyond two years
• Blade feathering
• Fog cut-out
• Compensation for fatalities (conservation easements / offsets)
• Increased cut-in speeds applied to turbine or turbine groups
• Other technological advances as research into fatality prevention and reduction evolves.</td></tr>
</table>

- In cases where the provincial and federal rankings differ, the federal designation must be used to determine the appropriate Tier
- In cases where the provincial ranking contains two or more rankings (e.g. S2M, S1B), the ranking with the lowest number must be used to determine the appropriate Tier.
  - For example, if a bird was ranked S3B, S2M then it would be considered to have an S2 ranking and therefore included in Tier 3. Provincial ranking information can be found at: www.biodiversity.sk.ca/SppList.htm (provincial rankings are contained in the field marked Subnational Rank). This list will be updated frequently as species are reassessed, the most up-to-date copy should be used.
- Annual fatality triggers are after an estimator for carcass removal and searcher efficiency has been applied as part of the fatality monitoring analysis.
- Annual fatality triggers do not include bird species listed in Section 4(1) of *The Wildlife Regulations*.
- Significant fatality event numbers are observed fatality and do not have an estimator applied.

4.2.2 Personnel Qualifications

The PCMP will be designed and managed by a qualified wildlife biologist with experience identifying bird and bat species by sight and/or sound, familiarity with the habitat requirements of species that will be encountered within the PDA, and experience leading and managing wildlife species surveys. The carcass searches, searcher efficiency trials and carcass persistence trials will be conducted by trained technicians under the supervision and guidance of the qualified wildlife biologist.

4.2.3 Carcass Searches

Carcass searches will be conducted in accordance with the AM Guidelines and under a Research Permit from ENV that will be acquired prior to commencing the PCMP each year. The methods, survey area, survey extent, frequency and duration for the carcass searches are provided below.

4.2.3.1 Carcass Search Methods

Carcass searches will be conducted between the hours of one hour after sunrise to one hour before sunset. Searchers will walk concentric transects equally spaced 5 m apart, at approximately 2-4 km/hr depending on the vegetation cover, within the survey areas around all selected WTGs for the Project. OTW LP will manage the vegetation height within survey areas beneath the WTGs, wherever possible. By maintaining the vegetation height, the searcher efficiency is expected to increase for carcass searches.

Weather conditions may also affect searcher efficiency. As a result, carcass searches will not occur during extreme weather conditions of snow, heavy rain, or during high winds (i.e. Beaufort Wind Scale ≥ 8 or ≥ 40 km/hr, or as determined to be inappropriate conditions). In addition, for safety reasons, carcass searches will not be conducted during thunderstorm conditions. In these cases, the carcass search will be delayed to the subsequent consecutive day, wherever possible. If extreme weather conditions continue, the carcass search will resume on the next scheduled carcass search the following week.

Carcasses may be found incidentally underneath non-selected WTGs or in other areas of the Project (i.e. along access roads, etc.). The incidental carcasses will be collected and recorded in the field according to the survey methods in the PCMP. However, it will be noted that these are incidental carcasses and these specimens will not count towards the overall fatality rates for the Project, as it is unknown whether these deaths were caused by WTGs. In addition, all personnel on site are to report any carcass observed at the Project to OTW LP. All incidental carcasses will be reported in the annual report.

Data records will be submitted to ENV using the Wind Energy Bird and Bat Monitoring Post-Construction Loadform, as per the AM Guidelines.

Injured wildlife identified within the PDA will be reported to OTW LP and the nearest Compliance and Field Services Office. If possible, and as directed by the Compliance and Field Services Office, injured wildlife will be taken to the nearest Wildlife Rehabilitation Centre that will accept the given animal. If this is determined to not be possible (i.e. injuries are determined to be fatal in nature), in consultation with the Compliance and Field Services Office, euthanasia will be undertaken for the animal.

Carcasses found during searches will be collected in double plastic bags, identified, labeled, and frozen. At the end of each monitoring year (or as otherwise coordinated with ENV), carcasses of species at risk or sensitive species, and carcasses in excess of those required for searcher efficiency trials and carcass persistence trials in subsequent monitoring years, shall be submitted to the Royal Saskatchewan Museum in Regina, as per the AM Guidelines.

4.2.3.2 Survey Area

Carcass searches will be completed around the entire WTG in a survey area with a radius of half of the maximum height of the WTG, as measured from tip of blade to the ground, or a radius of 65 m, whichever is larger, in accordance with the AM Guidelines.

4.2.3.3 Survey Extent

A minimum of 10 WTGs or 30 percent of the total number of WTGs will be monitored, as per the AM Guidelines. As 33 WTGs are proposed for the Project, 10 WTGs will be searched for the PCMP.

The search WTGs will be selected through a stratified random sample, with representation of all habitat types identified and geographically across the Project. The selected WTGs include both edge and internal WTGs, according to the larger context layout of the Project. The selected WTGs will remain consistent among monitoring years for the duration of the PCMP.

4.2.3.4 Frequency

Carcass searches will be conducted on a weekly search interval over two search periods between April 1 and October 31; 8 weeks on monitoring during the spring period and 10 weeks of monitoring during the fall period.

4.2.3.5 Duration

Carcass searches will be completed for a minimum of two consecutive years following Project commissioning, and again on the fifth and tenth years of operation. The monitoring program for the fifth and tenth year will be scoped to address Project-specific issues, conservation objectives or species of concern within the PDA, and will clearly define specific measurements for success, as per the AM Guidelines.

4.2.4 Searcher Efficiency Trials

Factors such as vegetation height, vegetation type and density, carcass condition, including coloration and size of the carcass, and micro-topography can all influence the ability of a searcher to detect a carcass. Searcher efficiency trials will test all searchers for their efficiency at detecting carcasses during regular carcass searches at the Project. Carcasses used for searcher efficiency trials will be discreetly marked and placed throughout the search areas in the Project. The searcher efficiency trials will be conducted by other individuals or searchers that are not being tested (the tester). The searcher themselves will be unaware of the trial date and carcass locations (blind trial).

4.2.4.1 Searcher Efficiency Trial Methods

Searcher efficiency trial methods are based on the AM Guidelines. Two searcher efficiency trials will be conducted each year of the PCMP, using at least 20 carcasses per trial season per searcher, as factors affecting carcass detection may vary seasonally and by searcher. The trial seasons will be defined as the following two seasons in any given year of monitoring:

1. Spring: April 1 to May 31 (8 weeks)
2. Fall: August 15 to October 31 (10 weeks)

The trials will be conducted randomly within these time periods. The number of trial carcasses placed per trial date will be such as to not attract scavengers to the area, wherever possible, and will not exceed 3 trial carcasses per search WTG. The placement of the trial carcasses will be representative of the carcass search areas with regards to the WTGs, habitat types, and visibility types (i.e. easy, moderate, and difficult) searched. As there is the potential for trial carcasses to be scavenged, carcasses will be placed one day prior to the carcass search to duration in which the carcasses may be scavenged. If scavenging occurs, additional trials will need to be placed to meet the minimum. The locations (using a hand held GPS unit) and details of each trial carcass (species, condition, etc.) will be recorded by the tester to determine whether trial carcasses were found by the searcher, and for subsequent recovery of the carcasses if required. Following the day of the trial, the tester will determine if trial carcasses were missed during the carcass searches, and will collect them prior to leaving the Project.

Carcasses used for trials will consist of bats, small brown birds or mammal carcasses found during searches, wherever possible. If insufficient carcasses are obtained during carcass searches, surrogate carcasses (i.e. mice, gerbils, brown coloured chicks, or other bird carcasses) may be used in trials.

Searcher efficiency rates will be calculated as the number of trial carcasses collected, divided by the total number of trial carcasses placed during each trial. Searcher efficiency trial results will be used to adjust the fatality rates for birds and bats, as a correction of the efficiency of carcass detection by the searcher.

4.2.5 Carcass Persistence Trials

Scavengers and natural decomposition can render undetectable bird and bat fatalities due to the Project. Factors such as vegetation height, vegetation type and density, carcass condition, including coloration and size of the carcass, and micro-topography can all influence carcass persistence in the Project area. Carcass persistence trials will determine the rate at which carcasses are being removed from the carcass search areas by scavengers or through decomposition, and as a result not available for searcher to locate. Carcasses used for persistence trials will be placed throughout the search areas in the Project. The carcass persistence trials will be conducted by the searchers in conjunction with regular carcass searches.

4.2.5.1 Carcass Persistence Trial Methods

Carcass persistence trial methods are based on the AM Guidelines. Two carcass persistence trials will be conducted will be conducted each year of the PCMP, using at least 10 carcasses per trial season, as factors affecting carcass persistence may vary seasonally. The trial seasons will be defined as the following two seasons in any given year of monitoring:

1. Spring: April 1 to May 31
2. Fall: August 15 to October 31

The placement of the trial carcasses will be representative of the carcass search areas with regards to the WTGs, habitat types, and visibility types (i.e. easy, moderate, and difficult) searched. Trial carcasses will be placed at WTG locations that are not included in the carcass search subsample, if possible, but within the similar general area of the PDA to have persistence rates similar to the searched areas. A maximum of three carcasses will be placed per WTG per trial, in order to avoid attracting scavengers to the site. The locations (using a hand held GPS unit) and details of the trial carcass (species, condition, etc.) will be recorded and the carcasses will be checked during regular carcass searches (weekly) for up to 20 days, or until the carcass disappears, whichever occurs first. Technicians will wear gloves when placing the carcasses, to prevent human scent from transferring to the carcasses. In addition, remote wildlife cameras may be discretely placed at carcass locations, to record the specific date if the carcass was removed by a scavenger.

Carcasses used for trials will consist of bats, small brown birds or mammal carcasses found during searches, wherever possible. If insufficient carcasses are obtained during carcass searches, surrogate carcasses (i.e. mice, gerbils, brown coloured chicks, or other bird carcasses) may be used in trials.

Carcass persistence rates will be calculated as the amount of time until trial carcasses are scavenged (or decomposed), divided by the total length of time in the trial. Carcass persistence trial results will be used to adjust the fatality rates for birds and bats, as a correction of the rate at which carcasses are being removed by scavengers or through decomposition.

4.2.6 Data Analysis

Corrected fatality rates will be calculated using the Huso (2011) estimator, with the consideration of relevant revisions (e.g. bleed-through, Huso et al. [2012], bootstrapping [Manly 1997]). The use of the Huso (2011) estimator is consistent with standards in Saskatchewan and Alberta, and in accordance with the AM Guidelines. This estimator can calculate the fatality probability during carcass search transects. Alternatively, multiple estimators may be used simultaneously to analyze fatality data for comparison. ENV will be consulted if an alternative estimator to Huso (2011) will be used for the Project, and provided with rationale for the change.

4.3 Reporting Requirements

As per the AM Guidelines, reporting requirements for the PCMP may vary, depending on the fatality levels documented in each year of the PCMP (see Figure 1). At a minimum, data collected during the PCMP will be submitted annually to ENV in accordance with the Research Permit requirements, and an annual Post-Construction Monitoring Report will be prepared for the Project and submitted to ENV by February 1 of the following year.

As identified in the AM Guidelines, the annual Post-Construction Monitoring Report will include the following information:

- Methodology and rationale for any ministry-approved deviations from the AM Guidelines;
- Descripon of any turbine habitat type classes and identificaon of representative monitoring turbines. Turbine habitat type classes can be considered equivalent to Treatment Groups as defined in the Wind Energy and Bat Monitoring Database (Birds Canada 2020);
- Results of the carcass removal trials and searcher efficiency trials;
- Calculaon of the carcass removal and searcher efficiency using the Huso (2011) estimator;
- Corrected, summarized fatality rate for:
    - Non-raptor birds per WTG and per MW, by season (April-May, June-July, August-October) and by year;
    - Raptors per WTG and per MW, by season and by year;
    - Bats per WTG and per MW, by season and by year; and
    - Corrected, summarized fatality rate excludes bird species listed in Secon` 4(1) of the Wildlife Regulaons (GOS` 1981);
- Results of any Before-After-Control-Impact (BACI) studies or other population surveys that may have been required;
- GIS shapefile indicating which WTGs are being monitored and GPS locations of the individuals detected in the Casualty Surveys (i.e., carcass searches);
- Digital photographs of each carcass found in the Casualty Surveys in situ;

- Digital copy of the monitoring data that was submitted to ENV.researchpermit@gove.sk.ca in accordance with the Research Permit submission requirements; and
- Casualty Survey data per monitoring event per WTG including:
  - Turbine number and location;
  - Date and me the` WTG is surveyed;
  - Weather conditions, including wind strength and direction;
  - Vegetation surrounding the WTG;
  - Observer identity (consistent name or number for each observer); and
  - For each individual detected record:
    - Location (UTM coordinates);
    - Species;
    - Sex;
    - Age class (if apparent);
    - State of decomposition; and
    - Apparent injuries and signs of scavenging.

In addition to the annual Post-Construction Monitoring Report, additional reporting may be required, based on the fatality levels and resulting management triggers. In the event that the fatality of a wildlife species designated as Special Concern under the SARA or a provincially tracked species ranked S3, S3B or S3M is documented, a cause-and-effect analysis (CEA) may be required. The results of the CEA would be included in the annual report. In the event of a SFE, the event will be reported to ENV within 24 hours or on the following business day, and a CEA report will be prepared and submitted to ENV within 60 days of the SFE.

4.4 Operational Mitigation

OTW LP is committed to working in consultation with ENV to determine if operational mitigation is required for the Project, based on results of the monitoring programs. Due to effective site selection and design planning, it is not anticipated that operational mitigation will be required at the Project; however, annual results of the PCMP may determine that management triggers have been met in which additional mitigation measures may be required. OTW LP will conduct a CEA and discuss the results with ENV to determine the appropriate mitigation measures. Required mitigation will be determined on a case-by-case and site-specific basis, to address specific concerns and at the appropriate spatial scale (i.e., applied to WTGs where fatality exceedances occurred).

Potential mitigation measures, as identified in the AM Guidelines and the Wildlife Directive for Alberta Wind Energy Projects (GOA 2017b), may include (but are not limited to) the following:

- Increased PCMP reporting frequency;

- Extension of the annual PCMP beyond two years following Project commissioning;
- Altering cut-in speed (curtailment);
- Feathering of WTG blades; or
- Seasonal or temporary shutdown of WTGs.

5.0 Offsetting Plan

This offsetting plan is one component of the overall EPP, and consists of the final stage of a mitigation framework to address potential effects to natural land cover within a project area. The intention of a mitigation framework is to achieve at minimum a net-neutral effect of activities on natural land cover and features on the landscape. As there are small, but measurable, predicted residual effects to natural land cover from the Project, an offsetting framework was developed as mitigation for these potential residual effects.

Offsetting of residual impacts to natural land cover should be considered the final option to mitigating potential effects of a Project (Figure 2). Avoidance of potential effects, followed by mitigating effects are key to the overall reduction of a project's adverse effects on the environment.

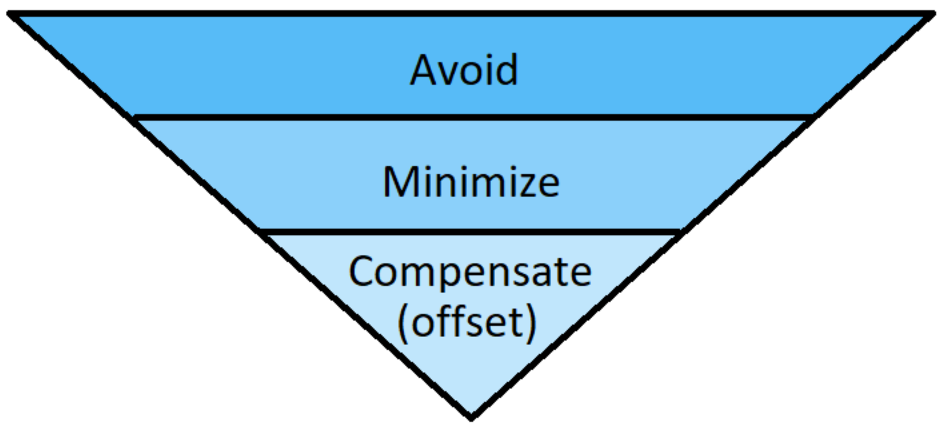

Figure 2. Mitigation Hierarchy

OTW LP has taken significant steps to apply proactive mitigation through avoidance of natural lands with preferential sighting on previously-disturbed land cover, and reducing or minimizing the area of natural land affected through design and approaches used (e.g., timing of activities). However, there remains small areas of natural land cover that could not be avoided or mitigated, and as such offsetting for natural lands disturbed as a result of the Project is a last resort to mitigate potential adverse effects.

5.1 Offsetting Framework

Offsetting of natural lands disturbed by the Project is based on the actual area of disturbance, and as such, is completed based on the as-built report completed following the end of construction activities. This approach is required as there may be minor modifications to the layout due to unforeseen limitations of the site, or opportunities to reduce the area of natural land cover impacted during construction. This framework was developed based on a review and inclusion of several components of recent and relevant offsetting frameworks, including:

- Draft North Dakota Native Wildlife Resources: Guidelines for reducing impacts from wind energy development (North Dakota Wind and Wildlife Collaboration. 2018.);
- Native Grassland Offset Plan for the Buffalo Atlee Wind Farm Project; Version 2, Appendix C (EDI Environmental Dynamics Inc. 2020);
- Collaborative Development of a Wetland and Grassland Compensation Plan for a Greenfield Potash Mine (Robertson et al. N.D.);
- Alberta Wetland Mitigation Directive (GOA 2018); and
- Manitoba-Minnesota Transmission Project: Wetland Offset Measures Plan and No Net Loss of Wetlands Plan. (Manitoba Hydro 2020.).

The framework for offsetting is a function of the location of disturbance (type of land cover disturbed) and the type of disturbance (specific activities). Combined, these allow for the accounting of the impacts by land cover that need to be mitigated. Likewise, there are also variations in the type of mitigation activities, which differ in their compensation value and benefits, selected to offset the impacts. The intention of the approach of assessing impacts and selecting offset mitigation is to achieve, at minimum, a net-zero balance on the landscape for each natural land cover type (see Equation 1). Some offsetting frameworks strive to achieve a net positive balance of offset and impacts; however, it is not the responsibility of one individual proponent to compensate for policies and activities on the landscape that have resulted in over a century of loss of natural land cover in Saskatchewan.

$$\text{Impacts (ha) to Land Cover A} \leq \text{Offsets (ha) of Land Cover A}$$

Equation 1.

5.2 Quantifying the Impacts

The first step in determining the level of compensation necessary through offsets is to quantify the extent of impacts to the landscape. This is done following the completion of the project phase during which the initial maximum extent of disturbances will be caused (typically the construction phase). An "as-built" report is prepared to document the actual detailed location and areal extent of project activities so that the area (ha) of disturbance to each land cover type may be quantified. Details of the physical activities in each area are also documented to differentiate areas of temporary (e.g., temporary workspace) and permanent disturbance (e.g., new access roads).

5.2.1 Land Cover Qualifying for Environmental Offsets

For the purposes of this offsetting framework, it is important to clearly define the land cover types that are included in the offsetting plan, and characterized in the as-built report. The types of land cover included in this offsetting plan, and the rationale for their inclusion are presented in Table 5-1. While land cover categories used in this EIS provide a greater level of detail of the cover types within areas of native prairie, the intention of broader land cover categories used in this offsetting plan is to acknowledge that the specific extent of grassland, shrubland or forest (deciduous or coniferous) within a given area of native prairie will vary depending on many factors and prescribing offset requirements to match exactly the proportion of each specific vegetation community in the area disturbed would be overly prescriptive.

Table 5-1: Land Cover Types Qualifying or Not Qualifying for Environmental Offsets

Qualifying Land Cover Types	Definition and Rationale for Inclusion
Terrestrial Native Prairie (includes areas with >30% cover by native plant species)	Native prairie consists of grasslands, shrubland and forest found within the Prairie Ecozone. It provides suitable habitat to native flora and fauna, including many species at risk. For the purposes of this plan, it is characterized as any terrestrial land cover within the Prairie Ecozone that contains greater than 30% native plant cover by area (AEP 2018).
Class I-II Wetlands	Class I-II wetlands, as defined using the Stuart and Kantrud (1971) wetland classification system, are ephemeral and temporary wetland basins that do not retain water year round. They are at greatest risk of loss due to the minimal works needed to fill in and convert to active cropland during drier periods. These are separated from Class III-V wetlands, as there are differences in applied setbacks and treatment during the planning phase.
Class III-V Wetlands	Class III-V wetlands include seasonal, semi-permanent, and permanent wetlands, and, for the purposes of this plan, do not include fish-bearing waterbodies. These classes are grouped together during the planning phase and are treated similarly during the mitigation phase.
Tame Pasture/Forage	Tame pasture and forage (i.e., hayland) are areas of planted cover that have less than 30% native plant species (AB 2018). While not a natural land cover type, it does provide suitable habitat for many species of fauna and flora, including some species at risk.
Non-qualifying Land Cover Types	**Rationale for Exclusion**
Fish-bearing Waterbodies	Fish-bearing waterbodies fall under federal jurisdiction and would require approval and compensation under the federal Fisheries Act. As such, they were not included in this framework. These lands do not apply to the Project as there are none within the Wildlife LAA (see Section 9 of the EIS).
Cropland	Cropland is a land cover type that is regularly disturbed on an annual basis, and provides marginal habitat for wildlife. As such, it is the preferred land cover type for siting developments and will not be included in this offsetting framework. Land owners are typically compensated for the loss of their productive croplands.
Urban/Developed Land	Urban and other developed lands, such as roads, yard sites, rail lines, etc., have been previously disturbed through other activities and are not considered suitable habitat to fauna and flora. As such, these lands do not require offsets.
Dugouts	Dugouts are artificial wetlands and waterbodies created for agricultural or recreational purposes. If dugouts are placed within existing wetlands, these wetlands will be included within the appropriate class category of wetlands above and considered for offsets if affected by the Project. Dugouts placed outside of wetlands will not be considered for compensation offsets.

While some mitigation frameworks attempt to take into account the presence or absence of species at risk on disturbed areas to determine the offset multiplier or ratio to apply to the offsets required for the impacts of a project, this approach was not adopted within this offsetting framework. The pitfall of including species at risk presence or absence lies in the assumption that detection of species at risk while conducting pre-construction surveys is a complete inventory of the species that inhabit an area of land. It also does not account for the recovery objectives of most species at risk, where creating suitable habitat in areas where these species do not yet occur will permit for the range expansion and colonization of suitable habitat within their historic range, but outside their present day range. As such, considering the broad habitat suitability through similarities in land cover and land use, while a more simplistic and broad approach, is also more defensible and robust. It also accounts for variability in a system through natural disturbance (e.g., changes to natural plant communities due to wildfire), which will affect the species inhabiting the landscape.

5.2.2 Types of Disturbance

The area affected by a Project is a function of the type of disturbance and the implications related to the loss or degradation of suitable habitat. For the purposes of offsetting, impacts to natural land cover disturbance will be categorized as either direct or indirect effects, and in terms of the duration of those effects.

The duration of effects is characterized as either temporary disturbance, where activities occur over a short period, or long-term or permanent disturbance, where the land cover is converted to a different land cover type beyond the construction phase (including post-construction reclamation) of the Project. Offsets are only required for effects that are long-term in duration. Temporary or short-term effects that can be addressed through other means of mitigation (i.e., reclamation as part of Step 2 - minimize) are not required to be compensated for through offsets.

Direct effects are those where activities occur directly in an area of land cover, whereas indirect effects are those where the land cover has not been physically altered, but habitat suitability is reduced as a result of sensory disturbances (e.g., noise and light). Calculating the area (ha) required for offsets as a result of direct long-term effects requires calculating the area of qualifying land cover types within the Project permanent footprint.

The approach to calculating the area of indirect effects required for compensation offsets applies a structure that aligns with the level of intensity of the disturbance created by each Project component or activity associated with the indirect effects. The intensity of the activity is based on the three categories: high, medium and low, as defined in the Saskatchewan Activity Restriction Setback Guidelines for Sensitive Species (ENV 2017). To calculate the area included in the qualified area for offsets, buffers around those components resulting in indirect effects are applied. The Project components assigned to each of the three categories, as well as the buffers applied for the areal calculation are provided in Table

5-2. Project components that are not anticipated to result in indirect effects include: MET towers, underground and overhead collector lines.

Table 5-2: Project Components and their Associated Intensity Category and Buffer Distance for Calculating Offset Areas

Intensity Category	Project Components Included	Buffer Distance (m)
High	Wind Turbine Generators	50
Medium	Substations	20
Low	Access Roads	10

While the indirect effects of those Project components may extend beyond the prescribed buffer distance, these distances consider that the effects are not direct and no changes to the actual land cover types are anticipated. Following the decommissioning of the Project, areas outside the Project permanent footprint will cease to be affected and return to their previous habitat suitability. It also considers that the effects are not adverse for all species.

The preparation of an as-built report following the completion of construction will be used to determine the actual area of direct and indirect effects requiring offsetting. An offsetting plan, including any agreements through third parties, will be established within 12 months of Project commissioning, to avoid delays in compensating for Project effects on the landscape.

5.3 Offsetting Approach

Following the determination of the qualified area requiring compensation through offsets, an offsetting approach will be determined. The determination of the offsets used as compensation must consider several factors, including the geographic area of the offsets, the method of offsets selected, and the type of land cover being offset.

Compensation of Project effects should occur within the same ecoregion as the Project to account for region-specific fauna and flora species composition. Should offsets occur outside of the Project ecoregion, (i.e., the Mixed Grassland Ecoregion), an increase of 50% in offsets will be applied.

5.3.1 Offsetting Native Prairie

Determining the appropriate compensation for the area of native prairie requiring offsets is primarily dependent on the method of offsetting. Native prairie is challenging to re-establish once directly affected through activities on the landscape. There are several options available to offsetting native prairie along with associated ratios required to achieve adequate compensation, which are outlined in Table 5-3.

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Table 5-3 Offset Methods, Applied Ratios and Rationale for Options to Offset Native Prairie

Offset Methods	Offset Ratio	Rationale for Offset Ratio
Restoration – Native Prairie	1:1	Restoration of previously disturbed areas back to native prairie is an intensive activity and difficult to achieve with success. It requires active management and monitoring to prevent establishment of non-native species. However, it results in a no-net loss if properly done.
Securement - Acquisition	2:1	Acquisition of native prairie lands that are at high risk of loss through conversion to cropland or other uses provides securement that allows perpetual control of the land and retention as native prairie. This allows for the greatest restriction on the land use, but is more expensive than establishing conservation easements.
Securement – Conservation Easement	3:1	Perpetual conservation easements on areas of native prairie that are at high risk for conversion to cropland or other uses provides securement of the land, but with lower controls over land use and disturbance to fauna and flora. As such, it requires a higher offset ratio than acquisitions.
Enhancement	5:1	Enhancement of lands with perennial cover to seed with an appropriate native plant mixture provides the re-establishment of native plant species, which are beneficial to fauna and flora. However, this may not result in the perpetual enhancement of habitat suitability and as such requires the highest offset ratio.

5.3.2 Offsetting Wetlands

As wetlands vary both in their class of permanency (Class I-V; Steward and Kantrud 1971), as well as in their function and quality, wetlands should be replaced on an equivalency basis. The area of wetlands directly and indirectly impacted will be calculated as outlined above. Following the calculation of the area of wetlands qualifying the compensation, a functional assessment should be completed to determine the quality of the wetlands being affected and those proposed for replacement. For example, wetlands heavily impacted through agricultural cropland activities are of lower quality than those that are relatively undisturbed in natural land cover. This functional assessment will serve to determine the appropriate offset ratio applied to the area of affected wetlands and considering the potential compensatory wetlands, following the ratios in
Table 5-4.

Table 5-4: Wetland Offset Ratios Based on Functional Assessment

Wetland Function Value Offset Ratios		Offset Wetland Value			
		A	B	C	D
Affected Wetland Value	A	1:1	2:1	4:1	8:1
	B	0.5:1	1:1	2:1	4:1
	C	0.25:1	0.5:1	1:1	2:1
	D	0.125:1	0.25:1	0.5:1	1:1

In addition to the functional assessment offset ratio applied to account for differences in functional value of wetlands on the landscape, the offset method used to compensate for direct and indirect effects to wetlands should follow those methods and ratios outlined in
Table 5-3 for native prairie.

5.3.3 Tame Pasture and Forage

As tame pasture and forage land has been previously disturbed and converted to non-native species, this land cover is generally considered less desirable than native prairie on the landscape, and is less suitable as habitat to many native species. However, its importance as habitat to some requires compensation offsets. Following the calculation of area requiring offsetting, as outlined above, the ratio for offsetting tame pasture and forage affected by the Project will be a 1:1 for restoration or securement methods outlined in
Table 5-3. Note that restoration in the case of tame pasture and forage only qualifies where non-native land cover types of lesser habitat suitability (e.g., cropland) are converted to tame pasture or forage.

To facilitate offsetting of affected lands and to promote the conservation of native land cover, a proponent may prefer to offset all terrestrial land cover (i.e., native prairie and tame pasture/forage) through one offsetting project. This one offsetting project may not have a combination of native prairie and tame pasture/forage. In such a case, the proponent may opt to compensate using an equivalent offset area of native prairie for the area of tame pasture/forage that is impacted by the Project.

5.4 Using Third Parties to Undertake Required Offsets

Where proponents do not have the expertise to undertake compensation offsets themselves, it is recommended that a third party be engaged to assist in the delivery of offsets. Conservation organizations and land trusts often have banks of mitigation projects that may suit the offset needs of the Project.

Should a proponent select to undertake the compensation offsets themselves, the offsets should be verified against the offset requirements of the Project by a third party to determine these have met the objectives of the offsetting plan. Third parties, used either to validate offsets delivered by the proponent or used to deliver the offsets, will provide a brief summary of offsets completed to the ENV – EASB as confirmation that this compensation commitment has been completed.

5.5 Case Study Example

To demonstrate the offset calculation approach, the following case study is provided. In this example, a wind energy project was constructed within the Moist Mixed Grassland Ecoregion and the area of qualifying land cover presented in Table 5-5 were provided in the as-built report.

Table 5-5. Anticipated Areas of Direct and Indirect Impacts of the Project by Land Cover Type

Land Cover Class	Direct Impacts (ha)	Indirect Impacts (ha)	Total Area to Offset (ha)
Broadleaf	0.0	0.5	0.5
Grassland	1.5	3.2	4.7
Shrubland	0.2	2	2.2
Drainage	0.3	1.3	1.6
Total Native Prairie	2.0	8.0	10.0
Tame Pasture/Forage	3.0	5.0	8.0
Class I-II Wetlands	0.4	0.9	1.3
Class III-V Wetlands	0.2	0.5	0.7

Step 1 – Determining the Area of Qualifying Lands Affected by the Project

Based on the areal values reported in Table 5-5, the proponent of this hypothetical project would require compensation for:

- 10.0 ha of native prairie,
- 8.0 ha of tame pasture/forage,
- 1.3 ha of Class I-II wetlands, and
- 0.7 ha of Class III-V wetlands.

The wetlands have an assessed functional value of D – wetlands heavily impacted and located within an agricultural crop field.

Step 2 – Determining Where the Offsets will be Completed

The offsets for this hypothetical project would be completed within the Moist Mixed Grassland Ecoregion, and as such no additional multiplication of the offsets is required due to Ecoregion differences.

Step 3 – Determine the Methods of Offsets

In this example, the proponent chooses to engage a third party organization to establish a conservation easement on a parcel of land previously identified. The parcel is private land within a landscape identified as high-risk of agricultural conversion, and is a mixture of 38 ha of native prairie and 3 ha wetlands with a function value B. The proponent has also selected to offset their impacts to tame pasture/forage with native prairie.

As the selected approach for offsetting is a conservation easement, the minimum areas of land cover required in the offset are as follows:

- <u>Native Prairie</u>: 10 (10 ha of native grassland) * 3 (3:1 ratio for conservation easements) + 8 (8 ha of tame pasture/forage [1:1 offset ratio for tame pasture forage]) =38 ha of native prairie, and
- <u>Wetlands</u>: 2.0 ha of wetlands (1.3 ha of Class I-II + 0.7 ha of Class III-V) * 0.25 (Offsets from Functional Value of D to Functional Value of B) * 3 (3:1 ratio for conservation easements) = 1.5 ha of wetlands.

The conservation easement parcel identified as an offset in this hypothetical scenario contains a higher amount of native prairie and wetlands than is the minimum required for the compensation offsets. As such it will satisfy the requirements of this offsetting plan.

6.0 Conclusion

This EPP has been prepared as a component of the EIS for the Outlaw Trail Wind Energy Project. The document is intended to provide a summary of the regulatory requirements and OTW LP's commitments related to environmental management during the construcon and` operaon phases of the Project. The EPP consists of an overview of the regulatory framework, a high-level descripon of the Project, an EMP, AMP and an offsetting plan.

The EMP is intended to inform Project personnel of the environmental constraints associated with the Project, and the mitigation measures that will be implemented during the construcon and` operaon` phases to avoid or reduce the potential environmental effects of the Project.

The AMP was prepared to outline OTW LP's commitment to adapveą management through the implementaon` of a PCMP, which will evaluate the actual effects of the Project on bird and bat mortality based on the current mitigation strategies, identify requirements for additional or alternate mitigation, and use the knowledge gained to inform future management plans.

The offseng plan was prepared` to provide the final stage of a mitigation framework to address potential effects of the Project on natural land cover types that cannot be addressed through avoidance and the mitigation measures described in the EIS and EPP.

As the wind energy industry is rapidly growing in Saskatchewan, OTW LP will consult regularly with ENV throughout the planning, construction, and operation phases the Project to obtain feedback and make potential adjustments to management plans as necessary.

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Appendix A

30 Day Written Spill Reporting Form

PRINT CLEAR

Discharge ID / Spill Report Number

Ministry of Environment

Government of Saskatchewan

30 Day Written Spill Report Form

December 2015 | CSB | CSB21001

A. Reporting Requirements

How do I report a discharge?

- Call the Ministry of Environment at **1-800-667-7525 (note:** this number IS NOT intended for general inquiries. It is an emergency line for reporting spills only.
- Submit this report within **30 days** of the date the discharge occurred.

This report ensures timely reporting of discharges that may cause or have caused adverse effects, and collects appropriate details about the discharge.

What do I report? This report requires the person reporting to have detailed information about the discharge and discovery, including the following:

- Site location
- Responsible party
- Substances involved in the occurrence
- Surrounding land use
- Agencies involved in the discharge

What happens next? Once the report is submitted, the ministry reviews it to determine its acceptability, in some cases in consultation with individuals involved in the discharge/discovery, and may include other agencies and impacted landowners. If the report is not acceptable, the ministry identifies deficiencies and requests that it be improved. There are numerous ways to obtain closure and the user should consult the impacted sites guidance document.

How do I submit the report? You can submit this application to the Ministry of Environment using our online services or by mailing a hard copy.

- **Web:** the preferred method is to sign in to our Online Services and submit it through your company's business portal. In the portal you can apply for and receive permission, fill out forms and submit documents online, review documents, and track your interactions with the ministry. Please visit the website: http://www.environment.gov.sk.ca/online-services.
- **Mail:** you can complete the report, save and print it, and mail the hard copy to:

  Environmental Protection Branch
  Hazmat and Impacted Sites Unit
  102 - 112 Research Drive
  Saskatoon, SK S7N 3R3

What if I have questions? For assistance completing this application or for more information, please contact our Client Service Office:
Email: centre.inquiry@gov.sk.ca
Tel (toll free in North America): 1-800-567-4224
Tel (Regina): 306-787-2584

NOTE: This form meets Environment Canada's reporting requirements when submitted as soon as feasible in accordance with Federal legislation regulations. It may be submitted to Environment Canada

- **by email (preferred):**
- ec.dalesaskatchewanrpn-eedsaskatchewanpnr.ec@canada.ca
- **or by mail:**

  Environment Canada
  10th Floor, Alvin Hamilton Building
  1783 Hamilton Street - Regina Sask S4P 2B6

B. Person Reporting

Company Name

Last Name

First Name Middle Name

Address

Address

City Province Postal Code

Country

Mailing Address ○ Same as above ○ Different from above:

Address

Address

City Province Postal Code

Country

Contact Details

Phone (main) Phone (work)

Phone (mobile) Email

Preferred Method of Contact ☐ Phone ☐ Email ☐ Mail

C. Responsible Party

Legal Name

Business Name

Address

Address

City Province Postal Code

Country

D. Fixed/Storage Facility Information *(if applicable)*

Facility Code Operation Identification

E. Discharged Material Details

Shipping Name Material Code (UNPN/NA #)

Chemical Abstract Service Registry (CAS) #

Material Comments

(include phase: solid, liquid gas

Concentration of Liquid Released (mg/kg)

Type of Package or Containment Classification

Total Mass/Volume Prior to Discharge Units

Mass or Volume of Discharge Units

F. Pressure Vessel Details *(if applicable)*

Pressure Vessel Yes No Certification Safety Marks

Description of Failure

G. Discharge Details

Date of Occurrence (DD/MM/YEAR)

Description of Events *Please attach any additional information as a separate document.*

Discharge Rate Discharge Rate Units

Duration of Discharge Temperature

Wind Speed (kph) Wind Direction Precipitation Type

Cloud Cover Relative Humidity (%)

Emergency Response Measures, and Subsequent Assessment and Corrective Actions	
How impacted materials were disposed of	
Closures resulting from spill (infrastucture disruptions ie. road closures etc.)	
Actions taken to prevent similar incidents in the future	
Long-term corrective actions (attach corrective action plan if more space required)	
Other details	

H. Discharge Location

Enter the Latitude/Longitude for center of the site in degrees, minutes, seconds.

Latitude:			Longitude:		
Deg:	Min:	Sec:	Deg:	Min:	Sec:

Address

Address

City | Province | Postal Code

Country

I. Distances and Direction to:

Nearest Community
Name | Direction | Distance

Nearest Well
Name | Direction | Distance

Nearest Surface Water Body
Name | Direction | Distance

Nearest Occupied Building
Name | Direction | Distance

Surrounding Land Use (within 500 m of discharge location)
Check all that apply ☐ Industrial ☐ Commercial ☐ Residential/Parkland ☐ Agricultural

J. Transportation Occurrence Details *(if applicable)*

☐ Road ☐ Rail ☐ Air ☐ Marine Type of Vehicle/Means of Containment

K. Emergency Response Assistance Plan (ERAP)

ERAP activated? ○ Yes ○ No ERAP Number

L. Effects on Public

Public evacuated? ○ Yes ○ No Public sheltered in place? ○ Yes ○ No

Number of People Affected Number of Deaths

Number of People Requiring Medical Aid

M. Emergency Response Agencies

Organization Type	Police	Agency Name	
Organization Type	Police	Agency Name	
Organization Type	Police	Agency Name	
Organization Type	Police	Agency Name	
Organization Type	Police	Agency Name	
Organization Type	Police	Agency Name	

N. Conditions for Submission

If reporting by regular mail, please make sure all related documents are included or attached as part of the submission.

I have read and I fully understand that these conditions must be met before the Ministry of Environment can accept, assess and process my report, and

I have read and I fully understand the requirements of this report, and wish to continue with my report, and

I certify that the information I have provided in this report is true and accurate in every respect.

☐ By checking this box, I accept these conditions.

Date of Report

Signature of Reporter

Appendix D

Engagement Program Materials

D.1 2019 Open House Poster Boards

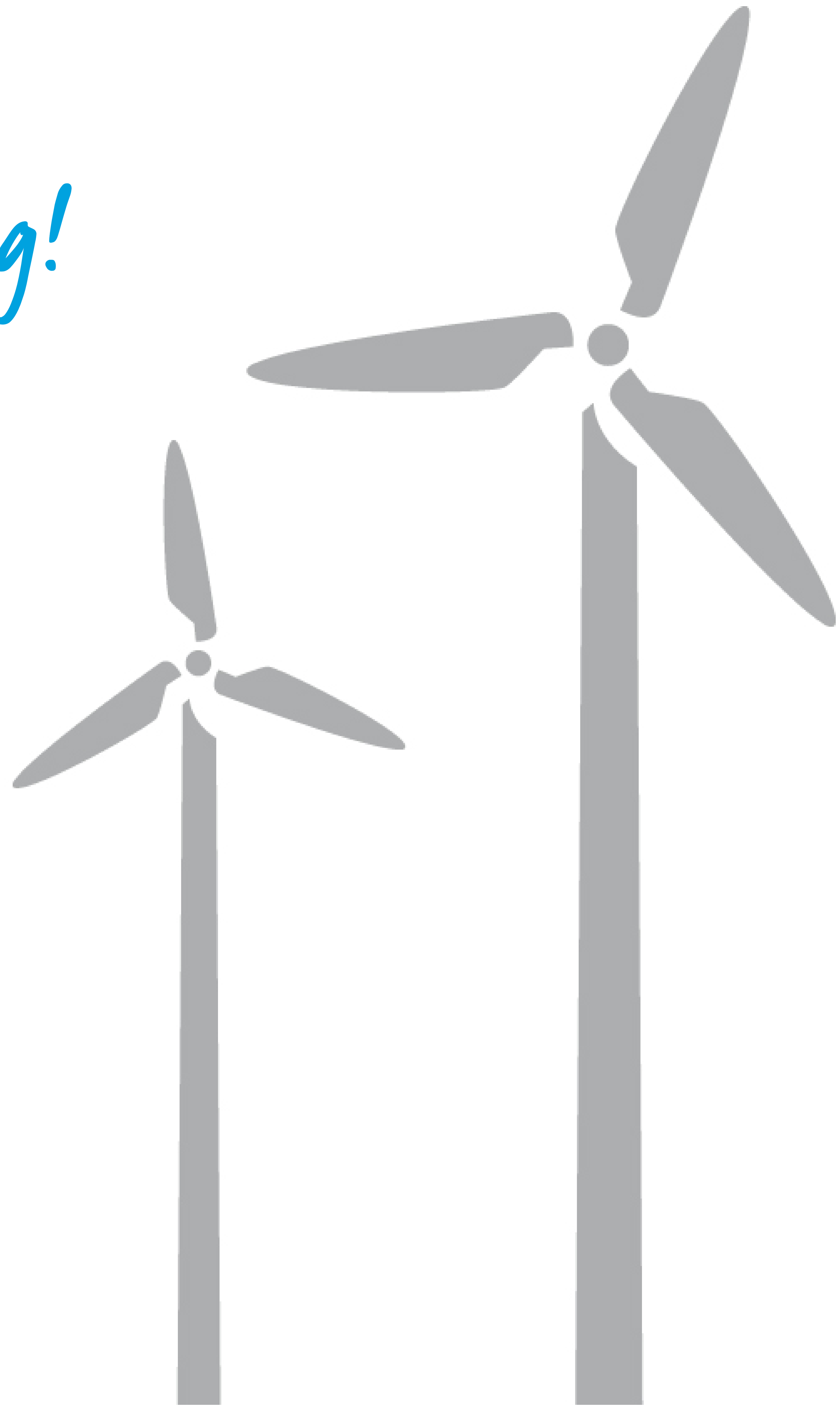
BluEarth™
RENEWABLES

Welcome to the Outlaw Trail Open House

Please sign in at the front desk and provide your contact information if you would like to receive Project updates.

We invite you to walk around and look at the displays. If you have questions or comments, please ask one of our representatives.

Thank you for attending!



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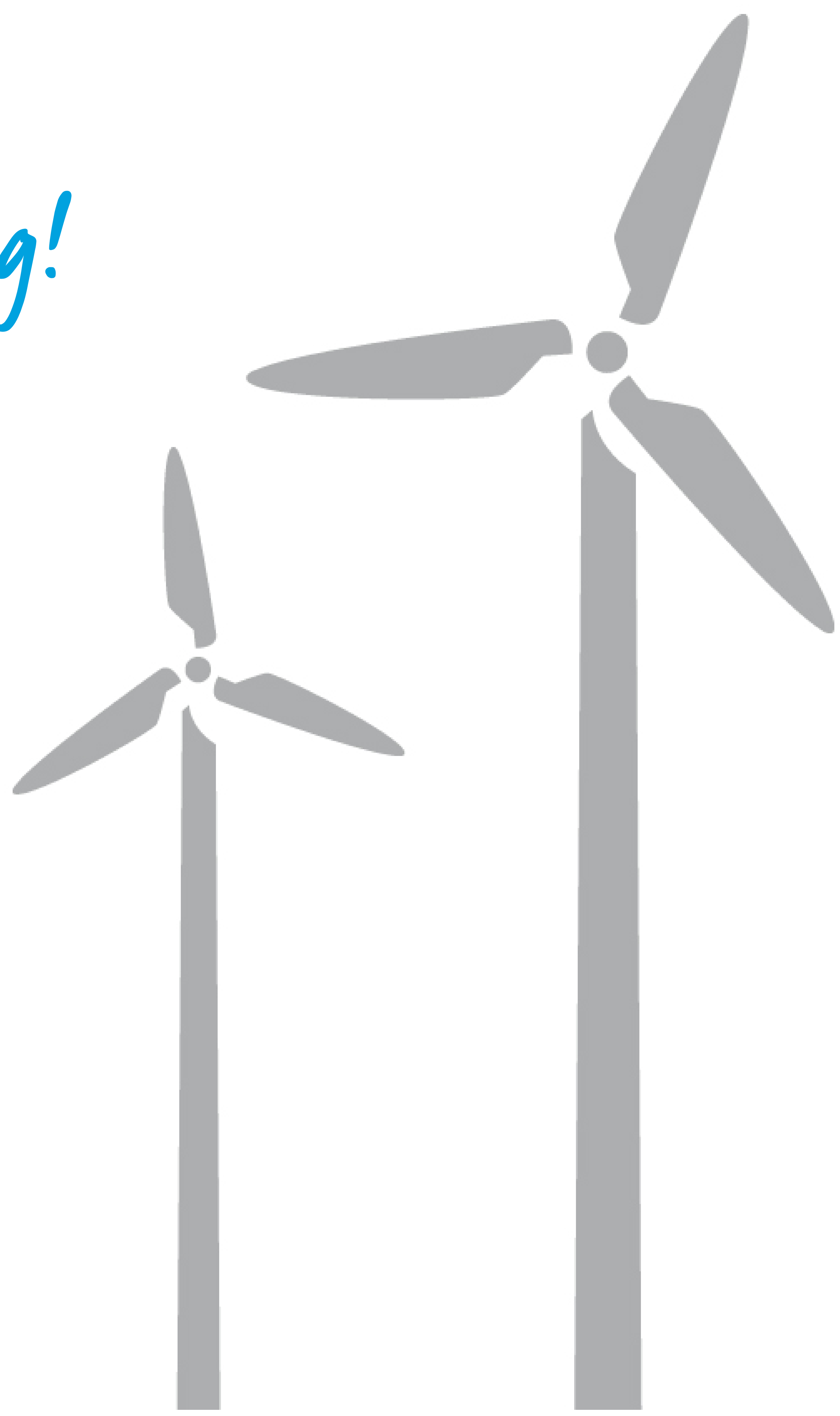
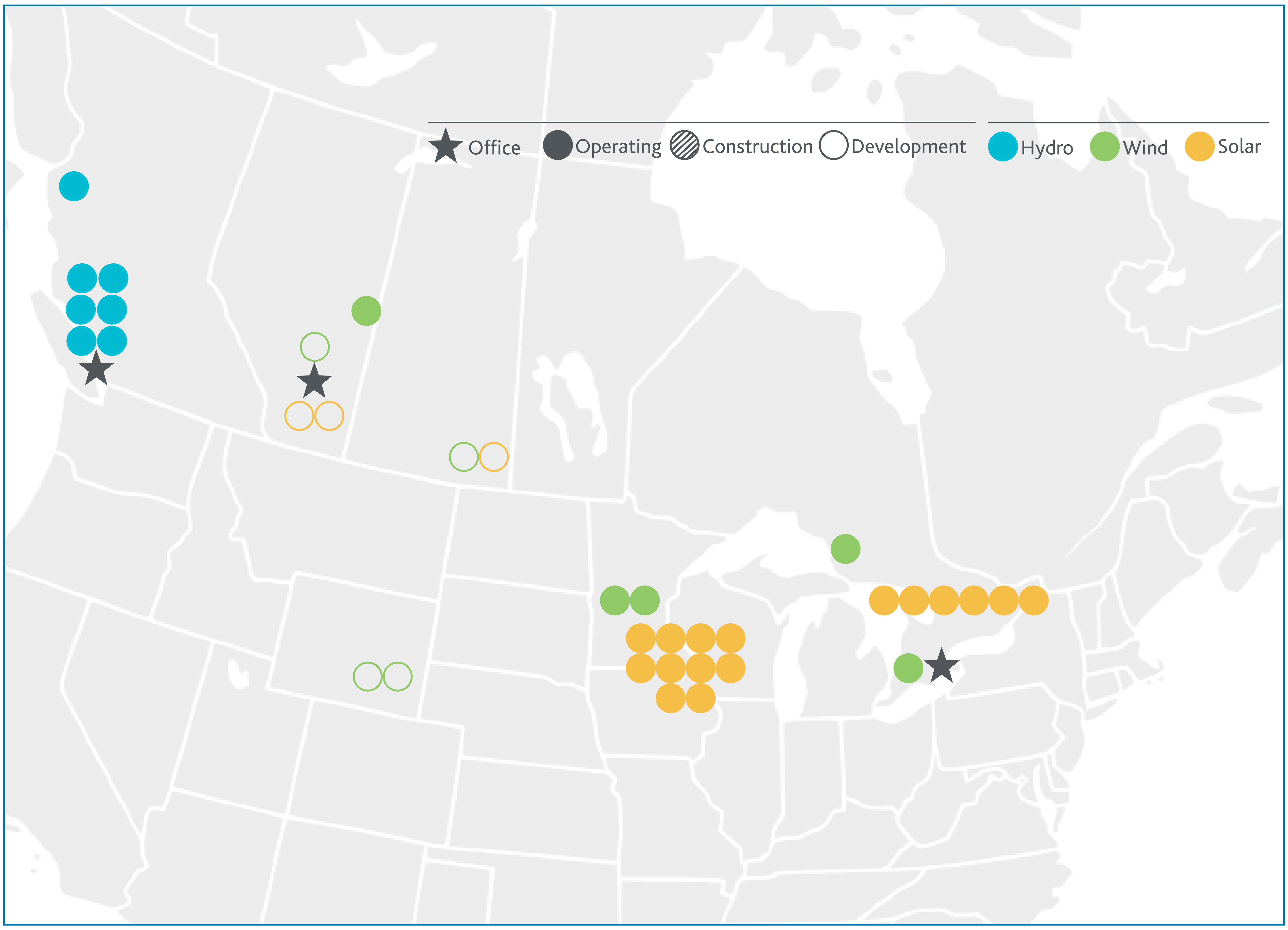


BluEarth Renewables

BluEarth Renewables brings together extraordinary people with the power to change the future™ by delivering renewable energy to the power grid every day. Headquartered in Calgary, we are a leading, independent, power producer that acquires, develops, builds, owns and operates wind, hydro and solar facilities across North America. Our portfolio includes 333 MW net (405 MW gross) of nameplate capacity in operation and under construction and over 1,000 MW under development.

For more information, visit bluearth.ca

Our Portfolio



Power to Change THE FUTURE™

Outlaw Trail Wind Project

Prairie Resilience

Saskatchewan's Climate Change Strategy

Electricity generation is the third largest source of emissions in Saskatchewan, responsible for 19% of total provincial emissions in 2015.

SaskPower is taking important steps toward the development of renewable energy projects in the province. In 2015, SaskPower set a target of having 50% of its electrical generation capacity come from renewable sources by 2030. That's double today's installed capacity of 25%. This ambitious goal will be achieved by a major expansion in wind power, augmented by other renewables, such as solar, biomass, geothermal and hydro.

BluEarth intends to bid the project into SaskPower's renewable energy procurement process, which would award long-term generation contracts for wind energy projects. This a competitive procurement process based on power price, so it will encourage competition among developers that will ultimately result in lower power prices from renewable energy projects.

BluEarth RENEWABLES™

Background

Development work on the Outlaw Trail Wind Project has been underway since 2016.

BluEarth Renewables first began outreach efforts on this Project in 2016. Over the last year, our team has been working to obtain approval from the Ministry of Environment, consulting with stakeholders and completing further technical and environmental studies as part of the development process.

We plan to submit the Project in the upcoming SaskPower renewable energy procurement, awarding long-term generation contracts for wind energy in Saskatchewan.

If offered a contract and the Project obtains the necessary approvals from the Ministry of Environment, Outlaw Trail could begin construction as early as 2022 to meet the required commercial operation date of late 2023.

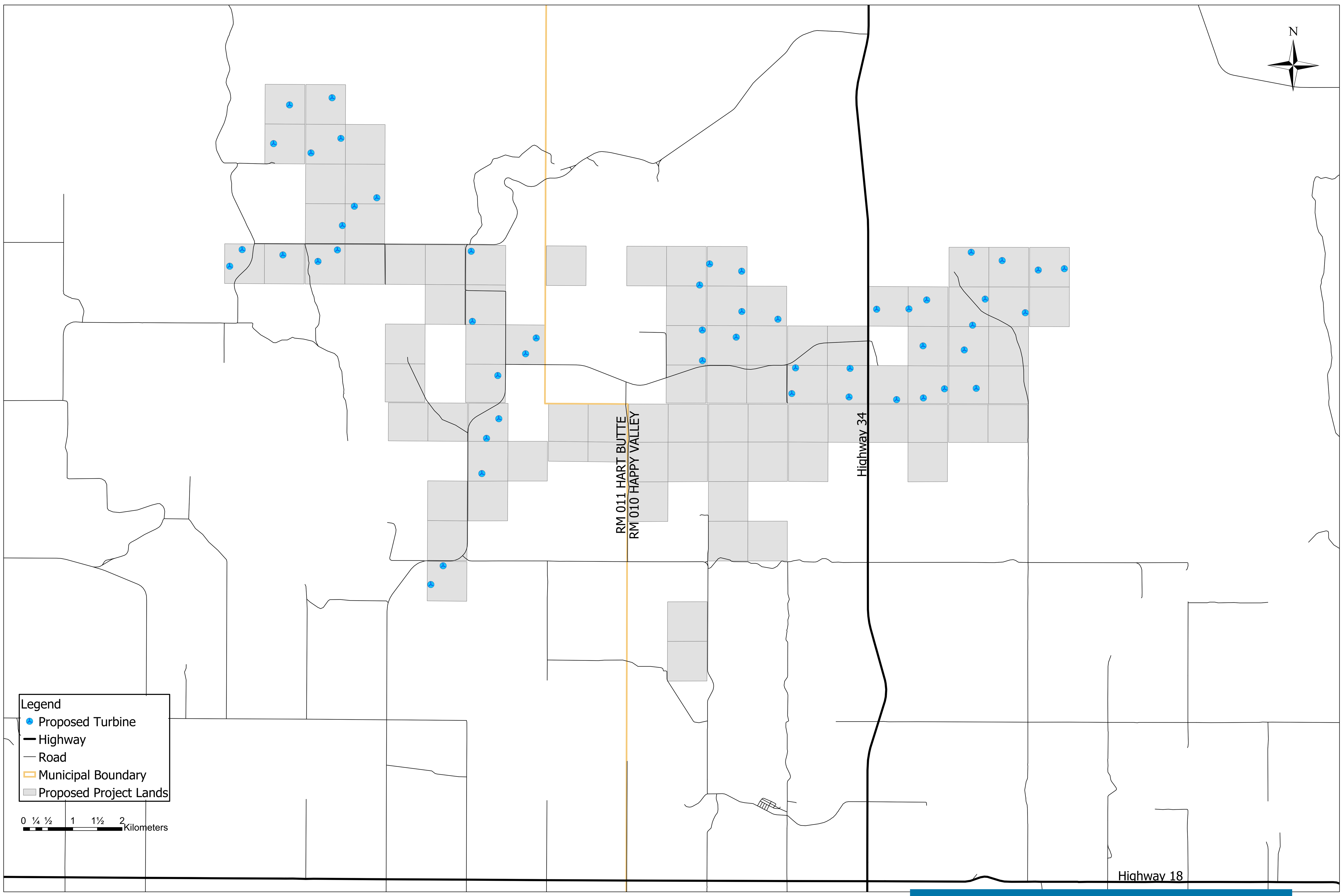
Project Description

The Outlaw Trail Wind Project would have a capacity of up to 230 MW, which is enough energy to power up to 100,000 homes annually with clean, renewable power. The Project would consist of up to 51, 3.8 -5.8 MW turbines located on private and Crown lands.

If the Project is successful in securing a power purchase agreement, we anticipate that construction could begin as early as 2022.

The Project facilities will include:

- 34.5kV electrical collector system
- 34.5kV to 230kV Project substation
- 230kv transmission line from Project substation to the SaskPower point of interconnection to the west, to be constructed by SaskPower
- An operations and maintenance building
- A concrete batch plant during construction
- Temporary and permanent access roads
- SCADA communications
- Other associated facilities



Proposed layout

Outlaw Trail Wind Project

BluEarth™ RENEWABLES

Why Here?

We consider several factors when choosing sites for wind projects.

The Outlaw Trail Project location was chosen for the following reasons:

- Excellent wind resource
- Close to existing power line infrastructure with enough capacity to take electricity generated from the Project
- Limited environmental constraints
- Compatible with existing land uses
- Suitable terrain with limited physical constraints
- Supportive landowners
- Good access options from highway
- Willing host communities with an appetite for energy generation

Outlaw Trail Wind Project

BluEarth™ RENEWABLES

Environmental Approval Process

As part of the environmental approval process, a Technical Project Proposal (TPP) was submitted to the Environmental Assessment Branch (EAB) in 2018.

The next step is to prepare and submit an Environmental Impact Statement (EIS) that will be made available for the public to review and comment on prior to the ministerial decision.

Proposal Development → Application → Screening → Scoping → Impact Assessment → Review → Public Comment → Decision by Minister

The Outlaw Trail EIS will include:

- Information about BluEarth Renewables and the Outlaw Trail Wind Project
- Where, when, and how the Project will be constructed
- Results of consultation with the public and other parties
- Results of field surveys and expected effects to the environment, including mitigation to avoid those effects
- Results of predicted noise and visual assessments
- Commitments to monitor the Project for effects during and after construction

Following approval by the EAB, municipal development permits and other permits will be applied for.

Outlaw Trail Wind Project

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Environmental Surveys

As part of the TPP / EIS development, the following environmental surveys have been completed to assess the area and identify sensitive features or species.

- **Desktop Analyses:** explored existing databases to identify historical records of rare plants, sensitive wildlife and heritage resource finds in the area.
- **Land Cover:** described what the land is being used for and what kind of plant communities are found on it (i.e. native grassland, cropland, hayland, pasture, wetlands, forest, etc.). Completed in 2016.
- **Raptor Nests:** surveyed the entire Project area in 2015 and 2017 for hawk, owl, and falcon nests.
- **Sharp-tailed Grouse Leks:** surveyed all suitable habitat within the Project area for grouse breeding leks in 2016 and 2017.
- **Breeding Birds:** communities of breeding birds were surveyed and described in the different land cover types in 2016 and 2017.
- **Burrowing Owls:** surveyed for the nest sites of burrowing owls in 2016 and 2017.
- **Vegetation Community and Rare Plant Surveys:** surveys to describe the plant community were completed in 2017 and follow-up rare plant surveys were completed in 2019 to determine the presence of rare or endangered plant species.
- **Breeding Amphibians:** wetland areas where rare frogs and toads may breed were surveyed in 2017.
- **Yellow Rails:** wetlands with suitable habitat for breeding yellow rails were surveyed in 2016.
- **Common Nighthawks and Short-eared Owls:** Nighthawk and short-eared owl activity was surveyed in 2016.
- **Bird Movements:** surveys for bird movement rates were conducted within and outside the Project area.

Outlaw Trail Wind Project

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Sound

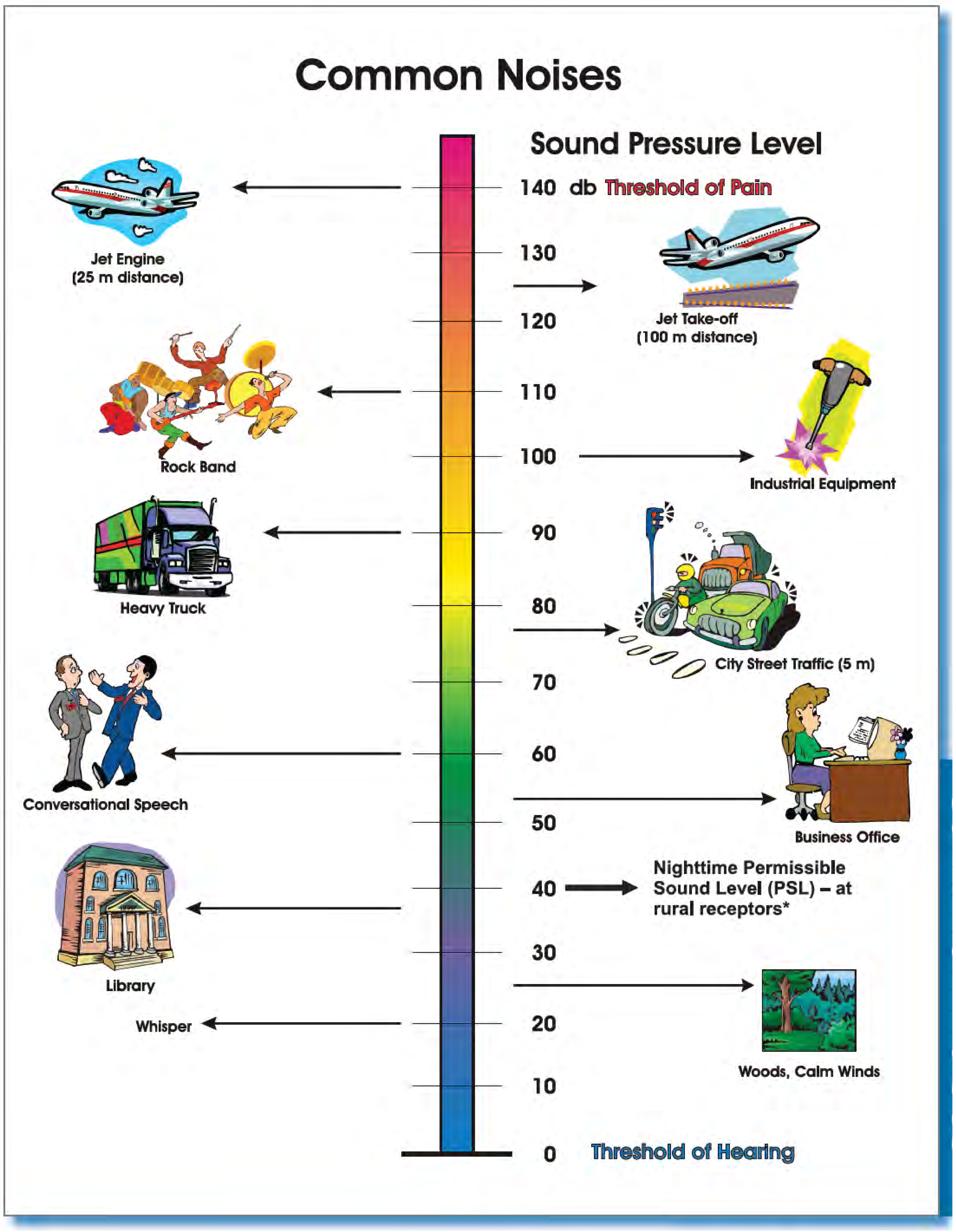
Detailed noise modeling is undertaken to ensure sound levels do not exceed 40 dBA (night time) at residences.

Currently, there is no regulation for noise levels in Saskatchewan, so we complete all sound modeling to align to the Alberta Utilities Commission regulatory requirement of 40 dBA at night time at all residences. This is the strictest noise regulation in Canada.

The noise modeling considers:

- Topography (hills and slopes)
- Ground cover (trees, water, grass)
- Existing noise sources (oil and gas infrastructure, highways)

Studies of the noise conditions within the Outlaw Trail Wind Project area are an important factor in selecting the final turbines for the Project.



* Permissible Sound Level (PSL) includes sound contribution from ambient (i.e. background) noise, other regulated facilities (e.g. oil and gas infrastructure, power/utilities infrastructure), and any newly proposed regulated facilities (i.e. the Project). Nighttime PSL at receptors in rural environments is 40 dBA.

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Community Benefits

The Outlaw Trail Wind Project will provide several benefits to the local community.

- **Construction Employment -** There will be up to 120 full-time workers during peak construction and an estimated 175,000 person hours.
- **Operations Employment -** The operations and maintenance of the facility will require a full-time, local team of six wind technicians and one site supervisor.
- **New Investment -** In the form of local services and supplies such as infrastructure improvements, fuel, accommodation, meals and supplies for employees, construction personnel, and contractors who will spend time in the local communities.
- **Landowners and Community -** Wind turbines are compatible with other land uses, such as farming, and can serve as a financial boost for rural economic development.
- **Municipal Tax Revenues -** The Project will pay taxes to the rural municipalities, with an estimated annual tax revenue of $800,000 between Happy Valley and Hart Butte. In addition, the project does not increase demand on municipal services or public works such as sewer and water upgrades.
- **Clean Energy -** Wind energy provides societal benefits by offsetting harmful emissions such as carbon dioxide, oxides of nitrogen, and sulphur dioxides that are created through conventional, thermal power generation.
- **Ongoing Community Investment -** Through the life-cycle of the Project, we will continue to invest in the local community through business operations and annual donations.

Outlaw Trail Wind Project

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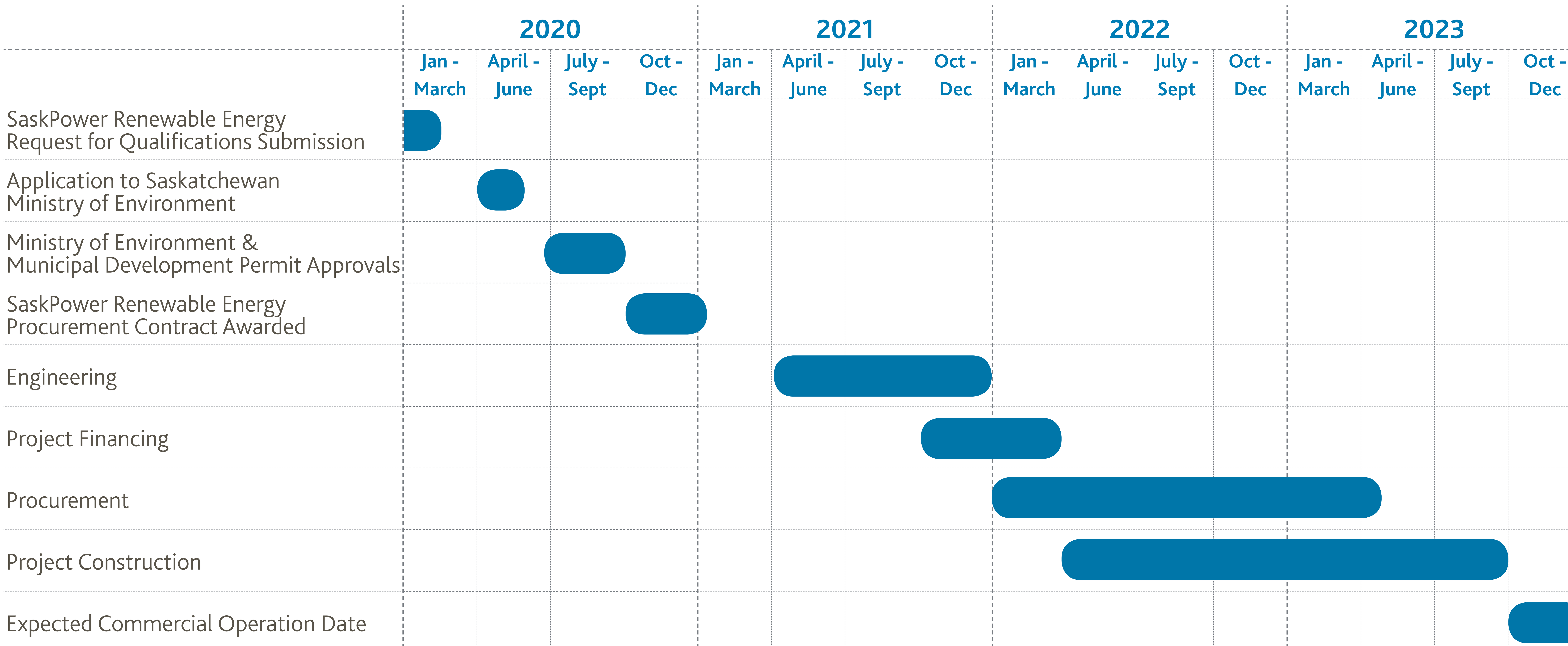
Project Schedule

If the Outlaw Trail Wind Project is successful in securing a contract, we anticipate that construction would begin no earlier than 2022.



Project Decommissioning

At the end of the Project life, the site will be decommissioned and reclaimed based on industry standards and best practices.

Decommissioning

- Wind turbine removal - disconnected, dismantled and removed from site
- Substation removal - components disconnected, dismantled and removed from site
- Concrete foundations (wind turbine pads, crane pads, substation) removed to a depth of 3 feet (91 cm)
- Overhead electrical cables and support structures removed and taken off site
- Underground cables removed to a depth of 3 feet (91 cm)
- Roads to be decommissioned and gravel removed*
- Operations and maintenance building to be removed*
- Gates and cattle guards to be removed, fence replacement*

Reclamation

- Roads, turnarounds, crane pads and foundations
- Decompaction of soil
- Filling voids and excavations
- Contouring of land to match pre-construction landscape
- Reseeding with appropriate seed mix as defined by appropriate governing body

* Unless requested by landowner to be left in place

Thank you for attending!

Please fill out a comment form and provide your feedback on the Outlaw Trail Wind Project.

Comments must be received by December 20, 2019 for consideration in our decision-making process and for inclusion in our Ministry of Environment filing.

If you would like to receive updates, please provide us with your name and contact information.

For more information on BluEarth Renewables and the Outlaw Trail Wind Project, visit:

www.bluearth.ca
projects@bluearth.ca
1.844.214.2578

BluEarth™ RENEWABLES

Power to Change THE FUTURE™

D.2 2019 Open House Project Fact Sheet

Outlaw Trail Wind Project

Project Overview

230 MW	100,000	7 Full-Time	$800,000
Nameplate Capacity	Homes Powered	Operations Positions	RM Annual Tax Revenue

The Outlaw Trail Wind Project is a 230 MW wind facility proposed on private and Crown land near Big Beaver, Saskatchewan. This Project would consist of up to 51 wind turbines and provide clean, renewable energy for approximately 100,000 homes annually.

The Project is located in the Rural Municipalities of Happy Valley and Hart Butte, approximately 5 km north of Big Beaver and 22 km south of Bengough.

BluEarth Renewables first began outreach efforts on this Project in 2016. Over the last year, our team has been working to obtain approval from the Ministry of Environment, consulting with stakeholders and completing further technical and environmental studies as part of the development process.

We plan to submit the Project in the upcoming SaskPower renewable energy procurement, awarding long-term generation contracts for wind energy in Saskatchewan. If the Project is successful in securing a power purchase agreement, we anticipate that construction could begin as early as 2022.

About BluEarth Renewables

BluEarth Renewables brings together extraordinary people with the power to change the future™ by delivering renewable energy to the power grid every day. Headquartered in Calgary, we are a leading, independent, power producer that acquires, develops, builds, owns and operates wind, hydro and solar facilities across North America. Our portfolio includes 333 MW net (405 MW gross) of nameplate capacity in operation and under construction and over 1,000 MW under development.

BluEarth Renewables is committed to ongoing engagement with the community, if you have any additional questions, please email us at projects@bluearth.ca or call 1-844-214-2578

Proposed Project Facilities Include:

- 34.5kV electrical collector system
- 34.5kV to 230kV Project substation
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- An operations and maintenance building
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- Temporary and permanent access roads
- SCADA communications
- Other associated facilities

BluEarth™ RENEWABLES

Power to Change THE FUTURE™

Outlaw Trail Wind Project
Frequently Asked Questions

How will this project benefit the local economy?

The Outlaw Trail Wind Project will benefit the local economy with an average of 120 full-time workers during peak construction, and during operations will employ six full-time wind technicians and one full-time site supervisor. The Project will also provide indirect revenue to the community in the form of local services and supplies, and will pay taxes to the rural municipalities with an estimated annual tax revenue of $800,000 between Hart Butte and Happy Valley. Wind projects provide stable income to local farmers and landowners from land lease agreements and allow farming up to the base of the turbine gravel pad, leading to increased diversification of local landowner income.

Are there environmental and health impacts from wind energy?

The global wind industry collectively continues to engage with experts in science, medicine and occupational and environmental health to monitor ongoing credible research in the area of wind turbines and human health (CanWEA, 2018). Health Canada published its own study in 2014, which found that wind turbine noise exposure was not associated with self-reported medical illnesses and health conditions.

We understand some individuals have concerns about wind facility construction and operation, and we take these concerns seriously. The Outlaw Trail Wind Project has been designed to meet or exceed all provincial regulations and guidelines in place to protect human health.

Below are studies on the relationship between wind turbines and human health, which can be accessed online. Links to these studies are available at www.bluearth.ca/outlaw-trail

- Health Canada: Wind Turbine Noise and Health Study: Summary of Results
- Journal of Occupational and Environmental Medicine: Wind Turbines and Health: A Critical Review of the Scientific Literature

Are wind turbines noisy?

The noise emissions produced by a wind turbine vary depending on the model and size. As there are currently no regulatory requirements for noise control in Saskatchewan, we are completing detailed noise modeling on the Project to align to the Alberta Utilities Commission regulatory requirement of 40dBA at night time at all residences. This is the strictest noise regulation in Canada. The sound pressure level of 40dBA is considered comparable to a quiet library.

Will the project have an impact on surround property values?

The most comprehensive study on wind facilities and property values to-date was conducted by the Lawrence Berkeley National Laboratory. The study analyzed more than 50,000 home sales near 67 wind facilities across nine U.S. states over 10 years and found no statistical evidence that operating wind facilities have had any measurable impacts on home sale prices.

Below are studies on the relationship between wind facilities and property value. Links to these studies are available at www.bluearth.ca/outlaw-trail

- Lawrence Berkeley National Laboratory: A Spatial Hedonic Analysis of the Effects of Wind Energy Facilities on Surrounding Property Values in the United States
- Canadian Journal of Agricultural Economics: The Effects of Wind Turbines on Property Values in Ontario: Does Public Perception Match Empirical Evidence?
- Journal of Real Estate Research: Wind Energy Facilities and Residential Properties: The Effect of Proximity and View on Sales Prices

Will my TV / internet be impacted by the wind project?

No. TV and internet signals are now primarily digital and will not be impacted by this Project.

Learn more at
www.bluearth.ca/outlaw-trail

D.3 2020 Stakeholder Consultation Package

Outlaw Trail Wind Project

January 20, 2020

Outlaw Trail Wind Energy Project

Stakeholder Consultation Package

Outlaw Trail Wind Project

January 20, 2020

Overview of Consultation Meeting

Thank you for the opportunity to present information about the Outlaw Trail Wind Energy Project to your organization. The purpose of these consultation meetings is to provide information about the proposed project and to solicit your feedback as the details of the Project are in the process of being finalized. Your input will be considered prior to the Project design being finalized and will be included in the Environmental Impact Statement (EIS) submission for review by the Saskatchewan Ministry of Environment.

In this information package, we have provided information about the proponent, BluEarth Renewables Inc., a brief overview of the Project, a summary of the environmental surveys and results, and the next steps of the regulatory review process and SaskPower 2020 wind energy procurement process.

Correspondence or requests for additional information may be sent by email to either:

Isabelle Deguise – isabelle@bluearth.ca

Or

Jean-Michel DeVink – jdevink@dillon.ca

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Our Portfolio

January 20, 2020

Project Background

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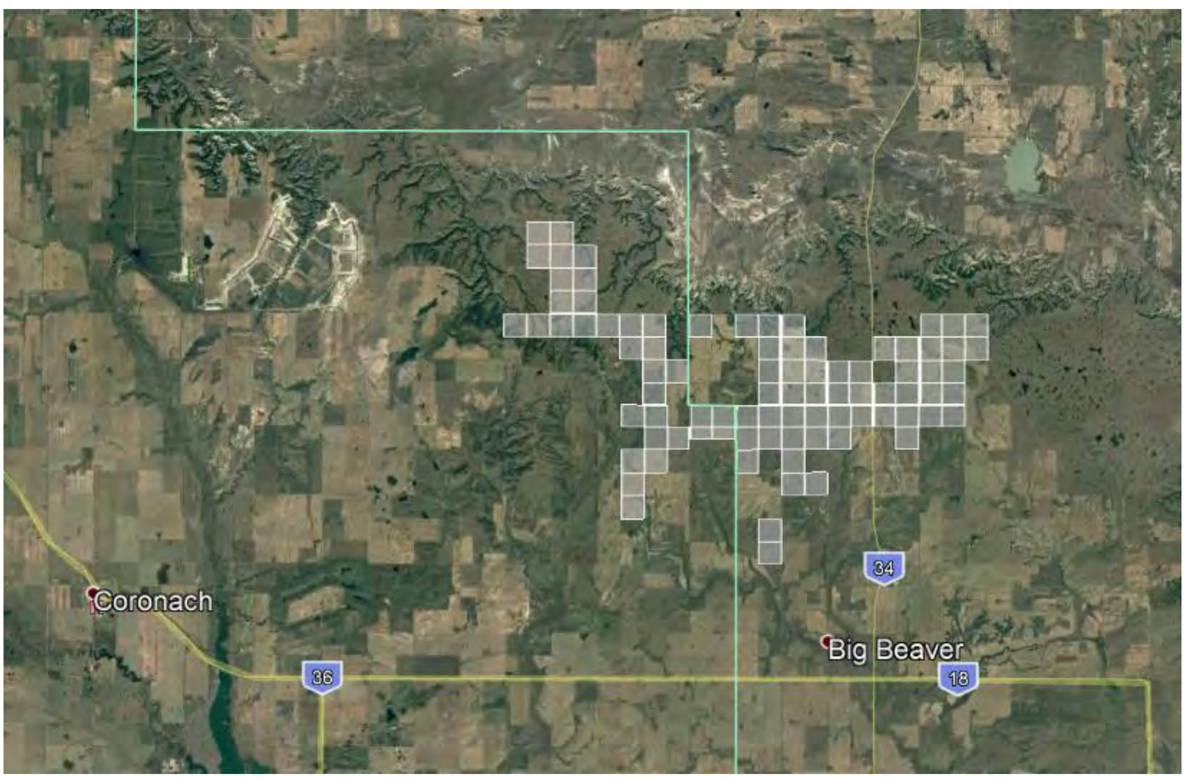


Figure 1. Outlaw Trail Leased Lands (white quarter sections) Available for Project Layout Development

Outlaw Trail Wind Project

BluEarth RENEWABLES

January 20, 2020

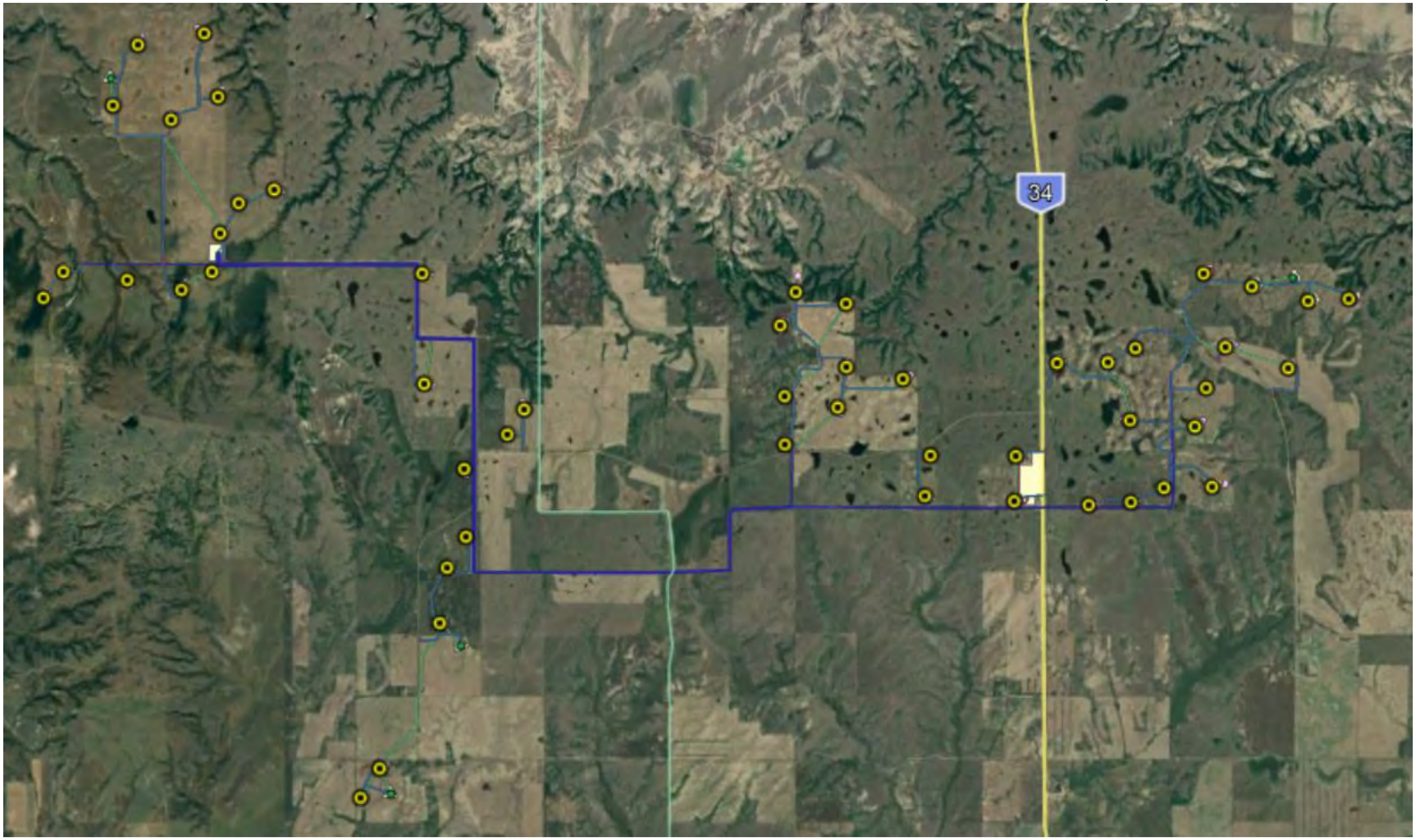


Figure 2. Proposed Layout of the Outlaw Trail Wind Energy Project

January 20, 2020

Why Here?

We consider several factors when choosing sites for wind projects.

The Outlaw Trail Project location was chosen for the following reasons:

- Excellent wind resource
- Close to existing power line infrastructure with enough capacity to take electricity generated from the Project
- Limited environmental constraints
- Compatible with existing land uses
- Suitable terrain with limited physical constraints
- Supportive landowners
- Good access options from highway
- Willing host communities with an appetite for energy generation

Outlaw Trail Wind Project

January 20, 2020

Summary of Environmental Surveys and Results

As part of the TPP / EIS development, the following environmental surveys have been completed to assess the area and identify sensitive features or species.

- **Desktop Analyses:** explored existing databases to identify historical records of rare plants, sensitive wildlife and heritage resource finds in the area.
- **Land Cover:** described what the land is being used for and what kind of plant communities are found on it (i.e. native grassland, cropland, hayland, pasture, wetlands, forest, etc.). Completed in 2016.
- **Raptor Nests:** surveyed the entire Project area in 2015 and 2017 for hawk, owl, and falcon nests.
- **Sharp-tailed Grouse Leks:** surveyed all suitable habitat within the Project area for grouse breeding leks in 2016 and 2017.
- **Breeding Birds:** communities of breeding birds were surveyed and described in the different land cover types in 2016 and 2017.
- **Burrowing Owls:** surveyed for the nest sites of burrowing owls in 2016 and 2017.
- **Vegetation Community and Rare Plant Surveys:** surveys to describe the plant community were completed in 2017 and follow-up rare plant surveys were completed in 2019 to determine the presence of rare or endangered plant species.
- **Breeding Amphibians:** wetland areas where rare frogs and toads may breed were surveyed in 2017.
- **Yellow Rails:** wetlands with suitable habitat for breeding yellow rails were surveyed in 2016.
- **Common Nighthawks and Short-eared Owls:** Nighthawk and short-eared owl activity was surveyed in 2016.
- **Bird Movements:** surveys for bird movement rates were conducted within and outside the Project area.

January 20, 2020

Wildlife Survey Results

Results of Environmental Surveys within the Assessment Area (1 km buffer of Project Leased Lands) are summarized below.

Sensitive environmental features detected that require Activity Restriction Setbacks (ARS):

- 1 Ferruginous Hawk nest observed (1,000 m ARS; March 15 to July 15)
- 6 Sharp-tailed Grouse leks observed (400 m ARS; March 15 to May 15)
- 5 ponds containing breeding Northern Leopard Frogs (500 m ARS; Year-round)
- No Short-eared Owls were observed
- No Yellow Rails were observed
- No Common Nighthawks were

Other results of environmental surveys:

- Bird movement surveys indicate that the area does not concentrate migratory birds compared to the broader landscape
- Bat activity surveys indicated moderate-high bat activity rates
- The breeding bird community observed at the site was characteristic of mixed agriculture/grassland species

Revisions to Project Layout and Land Cover Impacts

As part of the environmental approval process, a Technical Project Proposal (TPP) was submitted to the Environmental Assessment Branch (EAB) in 2018. Following the determination that the Project met the criteria of a Development under the *Saskatchewan Environmental Assessment Act*, information received from the EAB was considered and revisions to the Project Layout were completed. Current revisions to the layout of the Project generally include:

- Reducing the number of turbines, length of access roads, and length of collector lines
- Reducing the overall footprint from 374 ha to 278ha
    - 29 ha permanent footprint
    - 107 ha temporary disturbance (e.g., underground collector lines)
    - 142 ha mostly undisturbed (i.e., temporary construction area and laydown areas)
- Adjusting the layout to reduce disturbance to native prairie and increase setback from coulees
- Increasing setback distances from sensitive environmental features (Ferruginous Hawk nest and Sharp-tailed Grouse leks)
- Completely avoiding disturbance to wetlands of all classes (Class I-V)

The initial land cover within the Project Development Area (PDA; footprint of the project) included approximately 373 ha of land in the layout submitted in the TPP. A detailed breakdown of this land cover is provided in Table 1.

Table 1. Land Cover Breakdown of the Initial Layout Presented in the TPP and the Current Revised Layout.

Land Cover Type	Initial Project Layout (ha (%))
Cultivated Land	262.5 (70.2%)
Hayland	56.6 (15.1%)
Native Grassland	21.6 (5.8%)
Tame Pasture	21.3 (5.7%)
Urban/Developed	5.3 (1.4%)
Wetlands	5.1 (1.4%)
Treed or Drainage	1.2 (0.4%)

While the turbine layout has been revised, there is still the potential for changes to the access road and collector line system, which could result in changes to the land cover breakdown of the Project footprint. For example, discussions are currently ongoing with the two Rural Municipalities (Hart Butte and Happy Valley) to place portions of the collector lines in existing road right-of-ways. This change would result in an 87% (18.9 ha) reduction in potential impacts to native grassland. BluEarth is also exploring the option of offsetting for residual impacts to native grassland as a possible mitigation option.

Additional revisions are being explored, and will include consideration of feedback received through this consultation process. During the consultation meeting, we anticipate providing additional details about how land cover and the footprint is calculated for the Project.

January 20, 2020

Next Steps In Project Timeline

The next step is to prepare and submit an Environmental Impact Statement (EIS) that will be made available for the public to review and comment on prior to the ministerial decision.

The Outlaw Trail EIS will include:

- Information about BluEarth Renewables and the Outlaw Trail Wind Project
- Where, when, and how the Project will be constructed
- Results of consultation with the public and other parties
- Results of field surveys and expected effects to the environment, including mitigation to avoid those effects
- Results of predicted noise and visual assessments
- Commitments to monitor the Project for effects during and after construction

Following approval by the EAB, municipal development permits and other permits will be applied for.

SaskPower Wind Energy Procurement Process

SaskPower issued the 2019 Request for Qualifications (RFQ) in November 2019. Proponents may submit up to three Projects no larger than 200 MW each by January 27th, 2020, for review and evaluation, and SaskPower will select a list of projects that will qualify for the Request for Proposal (RFP) process. Through the RFP, SaskPower anticipates procuring in fall of 2020 up to 300 MW of new wind energy generation.

BluEarth will be submitting the Outlaw Trail project as part of this procurement process, starting with the RFQ submission.

January 20, 2020

Your Input

Thank you for the opportunity to engage with you on this proposed Project and for taking the time to review this information. We welcome your feedback on any aspect of the proposed Project, and would be happy to answer any questions or hear concerns or support on the Project and the information provided.

Your input is welcome at any point in the process and can be provided in writing to:

Isabelle Deguise – isabelle@bluearth.ca

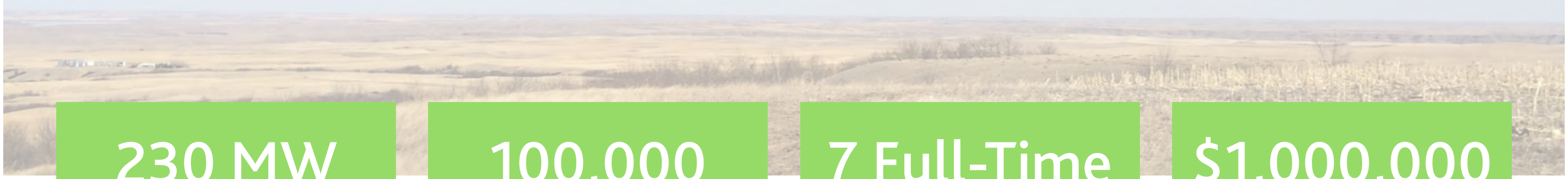
Or

Jean-Michel DeVink – jdevink@dillon.ca

D.4 2020 Project Newsletter

July 2020

Outlaw Trail Wind Project
Newsletter



230 MW	100,000	7 Full-Time	$1,000,000
Nameplate Capacity	Homes Powered	Operations Positions	RM Annual Tax Revenue

Project Update

BluEarth Renewables is committed to engaging stakeholders in the decision-making process for our projects and working together with honest and transparent communications. We are sending this newsletter to provide a community update on the development of our Outlaw Trail Wind Project located in the Rural Municipalities of Happy Valley and Hart Butte.

Since our last Open House in November 2019, development work has continued on the Outlaw Trail Wind Project. This has included work to obtain approval from the Ministry of Environment, consulting with stakeholders and completing further technical and environmental studies as part of the development process.

In 2018, we submitted a Technical Project Proposal (TPP) to the Environmental Assessment Branch as part of the environmental approval process. As a next step, we are preparing to submit an Environmental Impact Statement (EIS) that will be made available for the public to review and comment on prior to approval. You can learn more about what this EIS includes on our website at bluearthrenewables.com/outlawtrail.

We are continuing to progress the development of the Outlaw Trail Wind Project to ensure it remains competitive for future procurement opportunities. If the project is successful in securing a power purchase agreement in 2020, we anticipate that construction could begin as early as 2022 to meet the required commercial operation date of late 2023.

The Outlaw Trail Wind Project has a nameplate capacity of up to 230 MW, and would generate enough energy to power up to 100,000 homes annually with clean, renewable energy. In addition, this project will employ up to 120 full-time workers during peak construction (estimated 175,000 person hours), and during operations will require a full-time local team of six wind technicians and one site supervisor.

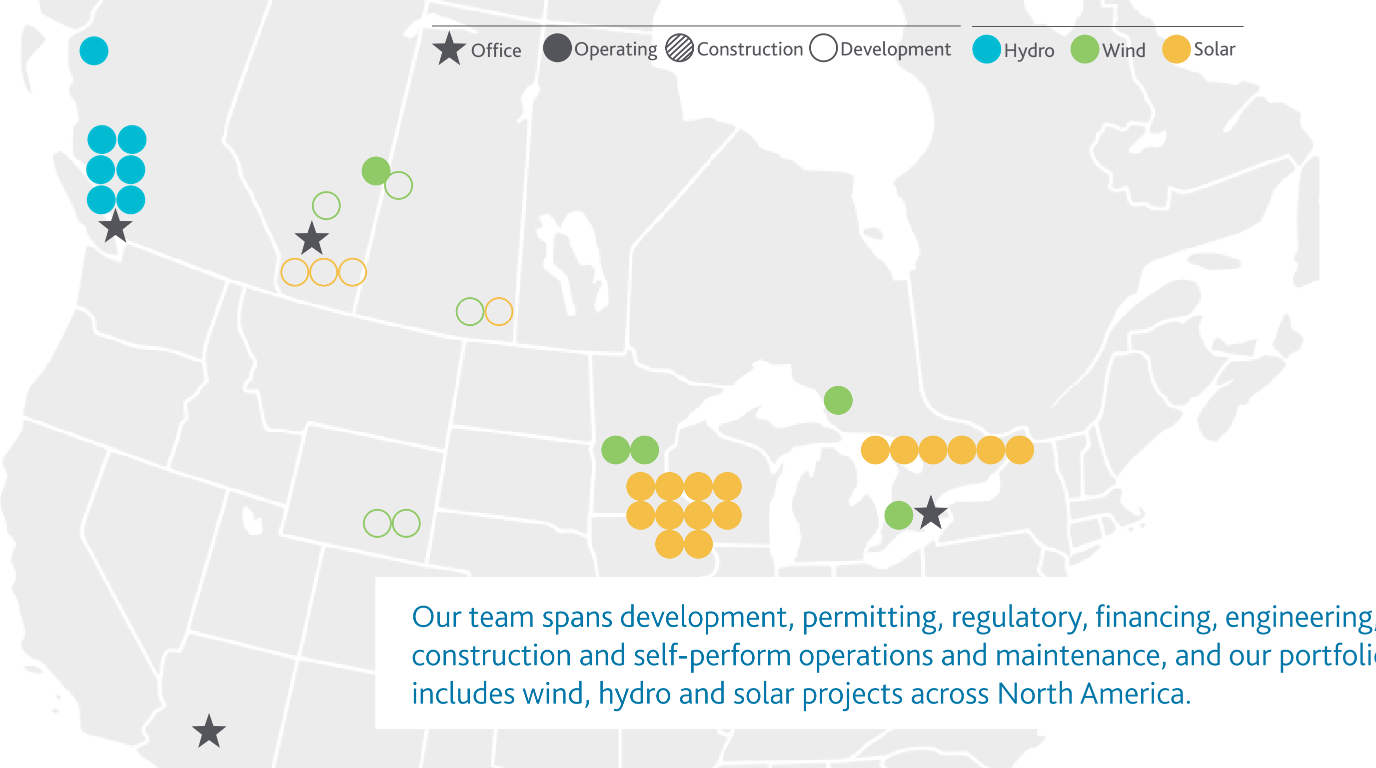
The project will also provide indirect revenue to the local municipalities in the form of local services and supplies, and will pay municipal taxes to the rural community with an estimated annual tax revenue of over $1,000,000 between Hart Butte and Happy Valley. In the RM of Happy Valley, the Outlaw Trail Wind Project could result in more than two times the current tax revenue for the community.

We look forward to working with you to strengthen the local economy and give back to the community for decades to come.

BluEarth™ RENEWABLES

Outlaw Trail Wind Project Newsletter

Our Portfolio



Our team spans development, permitting, regulatory, financing, engineering, construction and self-perform operations and maintenance, and our portfolio includes wind, hydro and solar projects across North America.

Giving Back Where We Live, Work and Operate

We are proud to be a part of the community, and we look forward to working with you to strengthen the local economy and give back to the community for decades to come. In 2019, we invested over $100,000 as part of our commitment to helping build healthy, thriving communities where we live, work and operate.

As part of our Community Investment Program, we also invite you to apply to the BluEarth Renewables Scholarship Program. Our Scholarship Program is designed to support, educate and inspire the next generation of leaders and professionals who have the power to change the future, and is specifically targeted at the communities where we live, work and operate.

- Indigenous Peoples Scholarship
- Community Leaders Scholarship
- Renewable Energy Trades Scholarship

Learn more and apply online at bluearthrenewables.com/scholarships

BluEarth Renewables brings together extraordinary people with the power to change the future™ by delivering renewable energy to the power grid every day. We are a leading, independent, power producer that acquires, develops, builds, owns and operates wind, hydro and solar facilities across North America. Our portfolio includes 333 MW net (405 MW gross) of nameplate capacity in operation and under construction and over 2,000 MW under development.

Visit: www.bluearthrenewables.com/outlawtrail
Email: projects@bluearth.ca
Phone: 1-844-214-2578

2020 Canada's Greenest Employers

KINCENTRIC Best Employer Canada 2019

Alberta's Top 75 Employers 2020

Appendix E

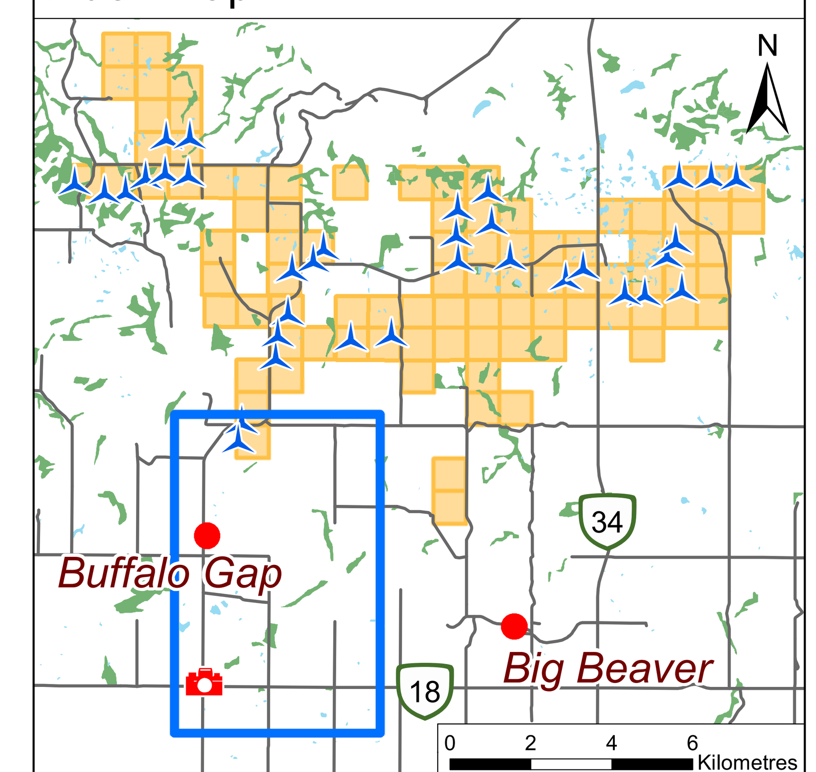
Visual Simulation Photomontage

BluEarth RENEWABLES INC.

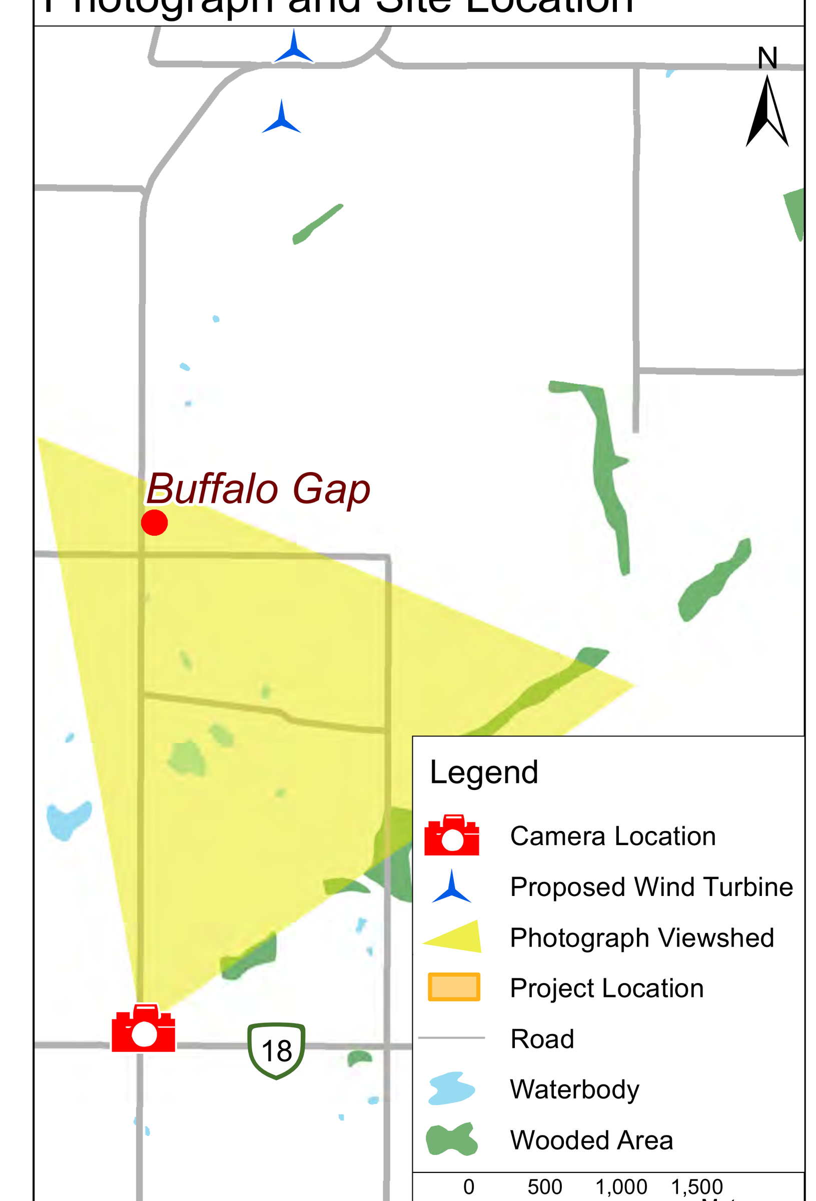
Outlaw Trail Wind Project

PHOTOMONTAGE OF PROPOSED 100MW WIND TURBINES FROM VANTAGE POINT 1 SOUTHWEST OF SITE

Index Map



Photograph and Site Location



Note: This photomontage is a general visual simulation of the proposed wind turbines. The final layout and design is subject to change.
Date: June 6, 2017
Photo Taken: May 24, 2017
Projection: NAD 1983 UTM Zone 13N
Sources: Natural Resources Canada.

CanACRE

Map17-0242 - Outlaw Trails 100mw - Vantage Point 1

Photomontage

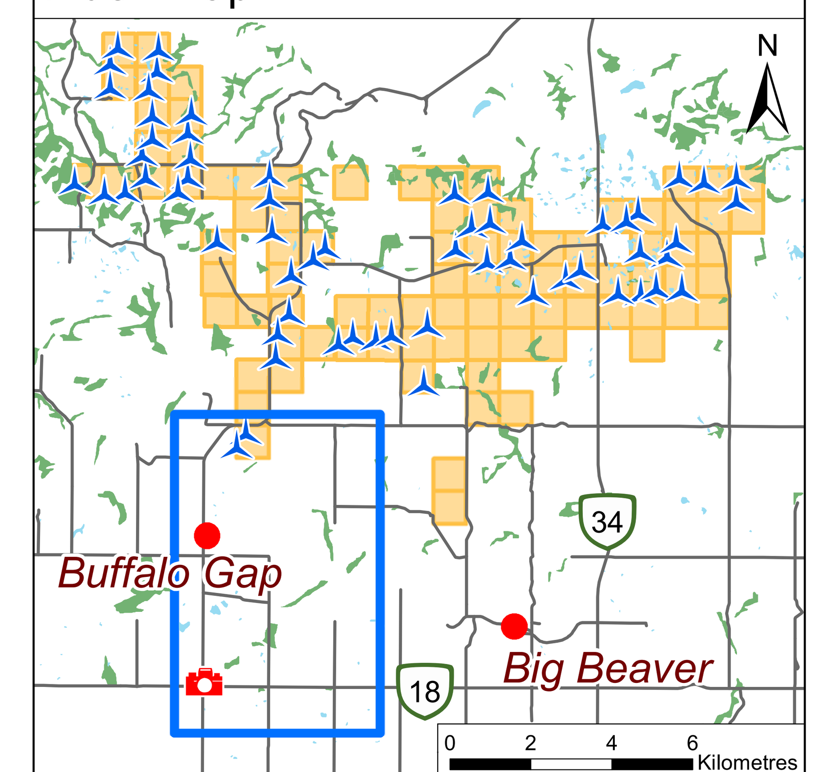
Original Photograph

BluEarth RENEWABLES INC.

Outlaw Trail Wind Project

PHOTOMONTAGE OF PROPOSED 200MW WIND TURBINES FROM VANTAGE POINT 1 SOUTHWEST OF SITE

Index Map



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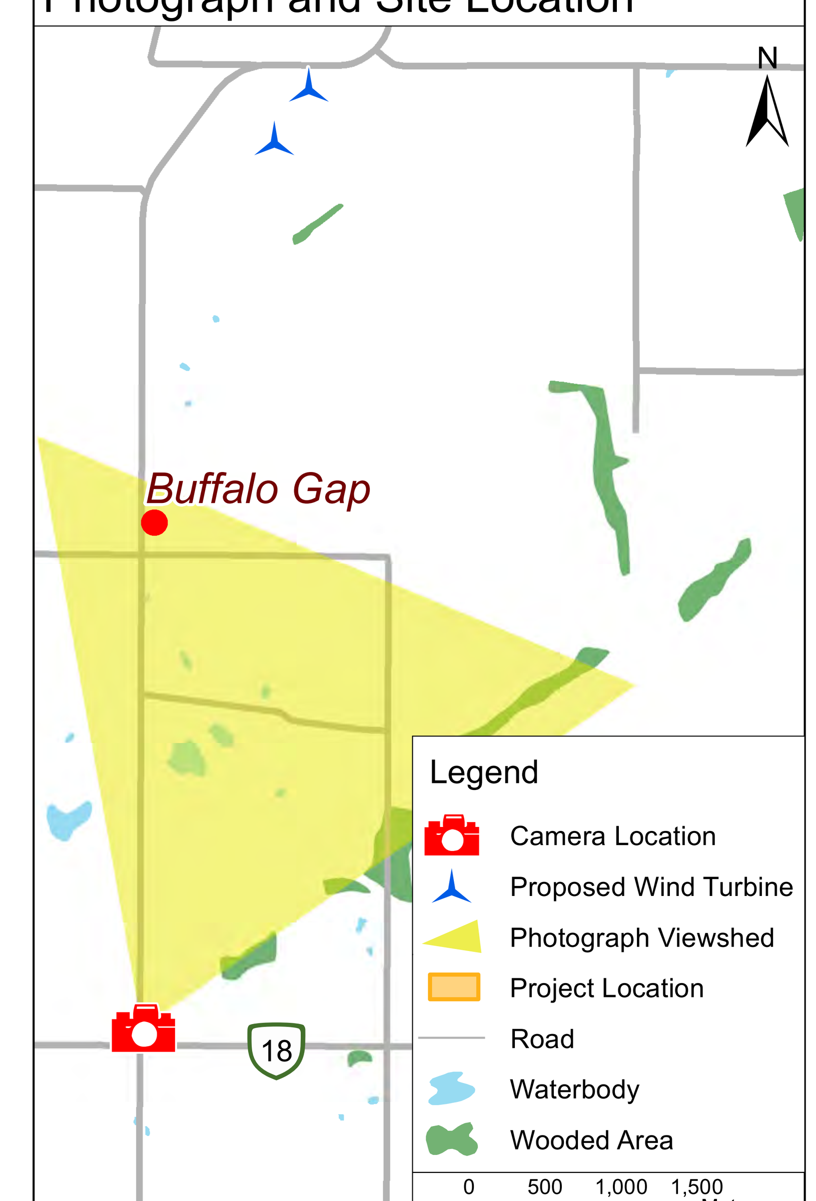

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Sources: Natural Resources Canada.

CanACRE

Map17-0242 - Outlaw Trails 200mw - Vantage Point 1

Photomontage

Distance to Nearest Infrastructure: 6.7km

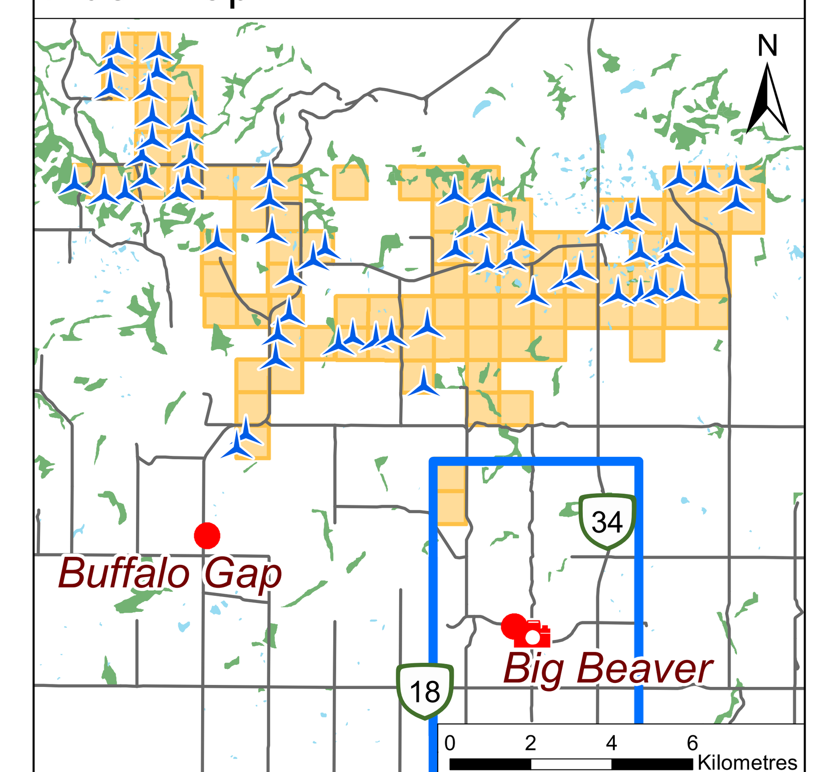
Original Photograph

BluEarth RENEWABLES INC.

Outlaw Trail Wind Project

PHOTOMONTAGE OF PROPOSED 200MW WIND TURBINES FROM VANTAGE POINT 2 SOUTH OF SITE

Index Map



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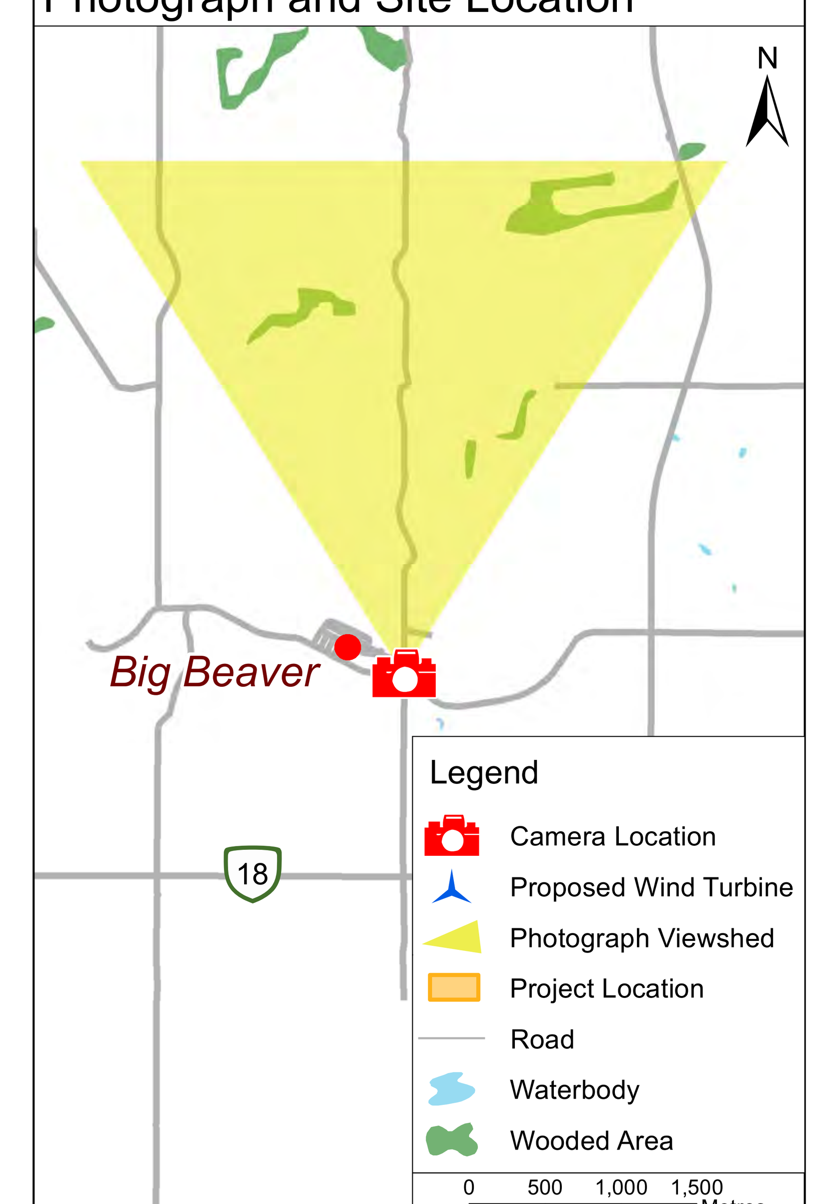

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Sources: Natural Resources Canada.

CanACRE

Map17-0242 - Outlaw Trails 200mw - Vantage Point 2 V2

Photomontage

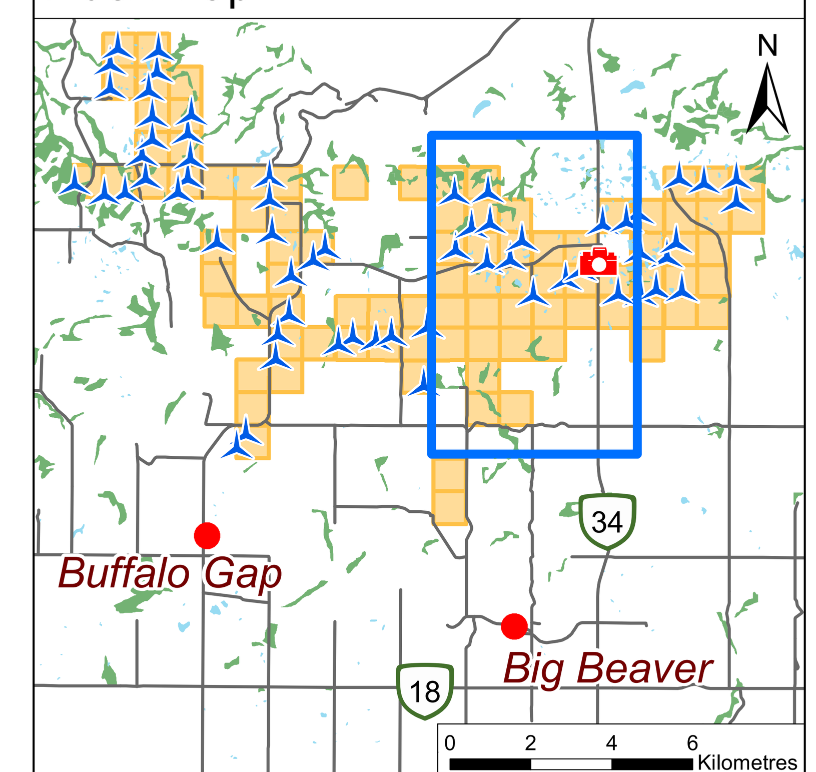
Original Photograph

BluEarth
RENEWABLES INC.

Outlaw Trail Wind Project

PHOTOMONTAGE OF PROPOSED 200MW WIND TURBINES FROM VANTAGE POINT 3 EAST OF SITE

Index Map



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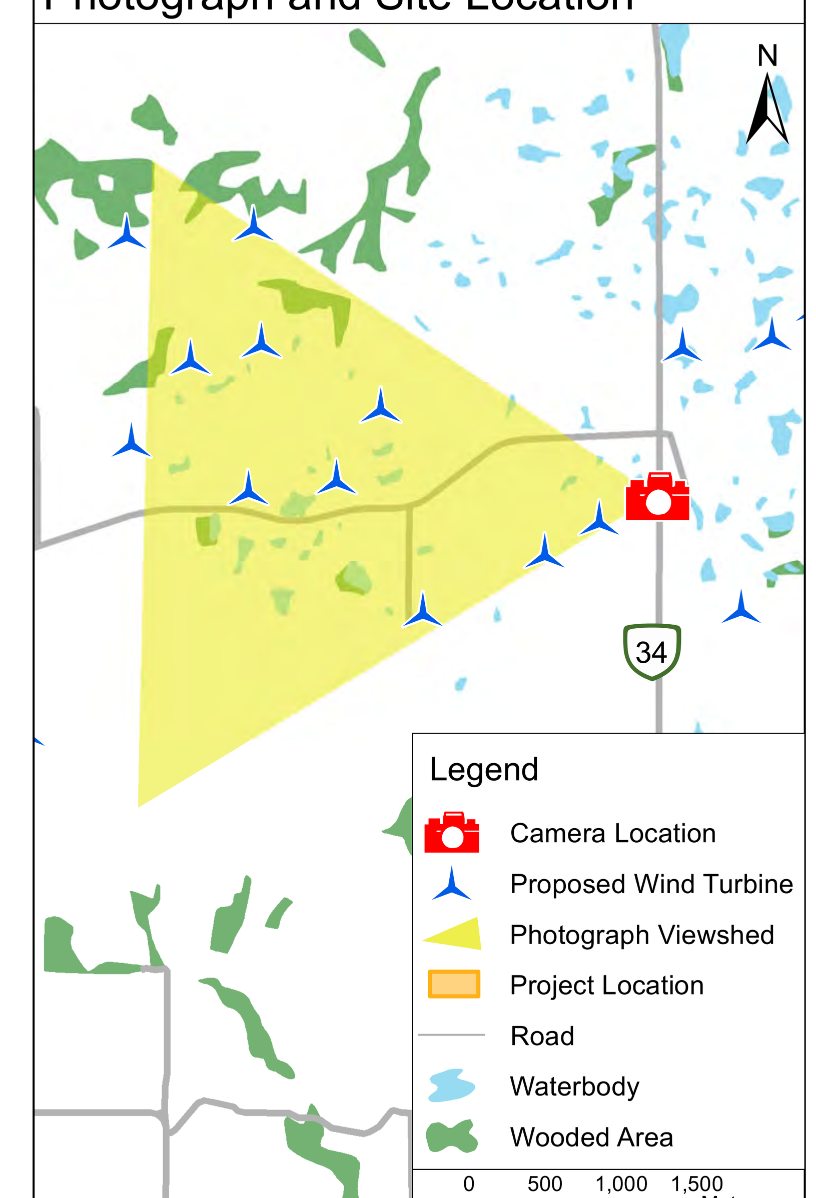

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CanACRE

Map17-0242 - Outlaw Trails 200mw - Vantage Point 3

Photomontage

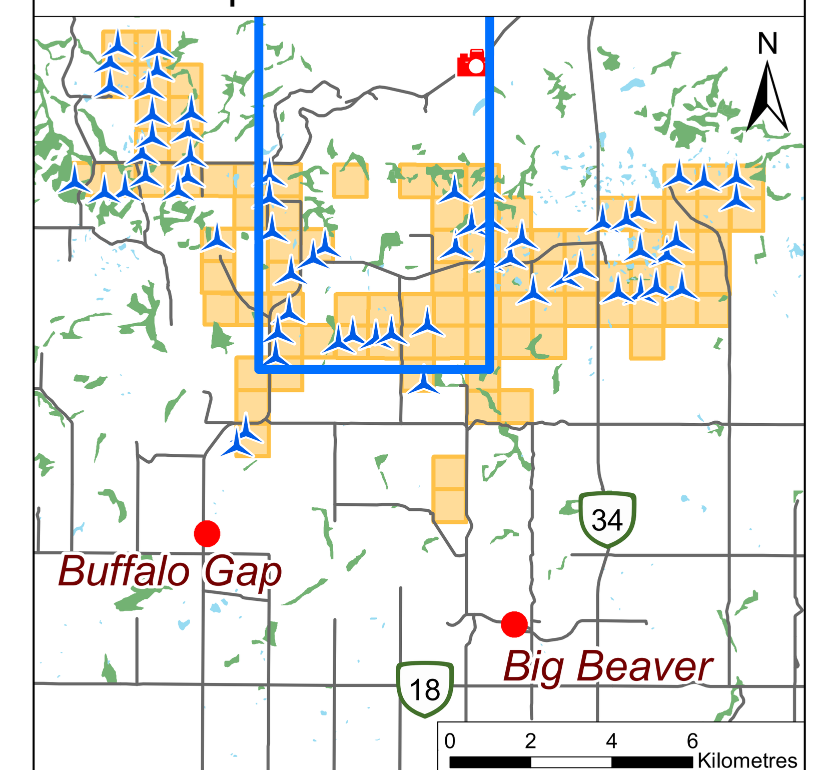
Original Photograph

BluEarth RENEWABLES INC.

Outlaw Trail Wind Project

PHOTOMONTAGE OF PROPOSED 200MW WIND TURBINES FROM VANTAGE POINT 4 NORTH OF SITE

Index Map



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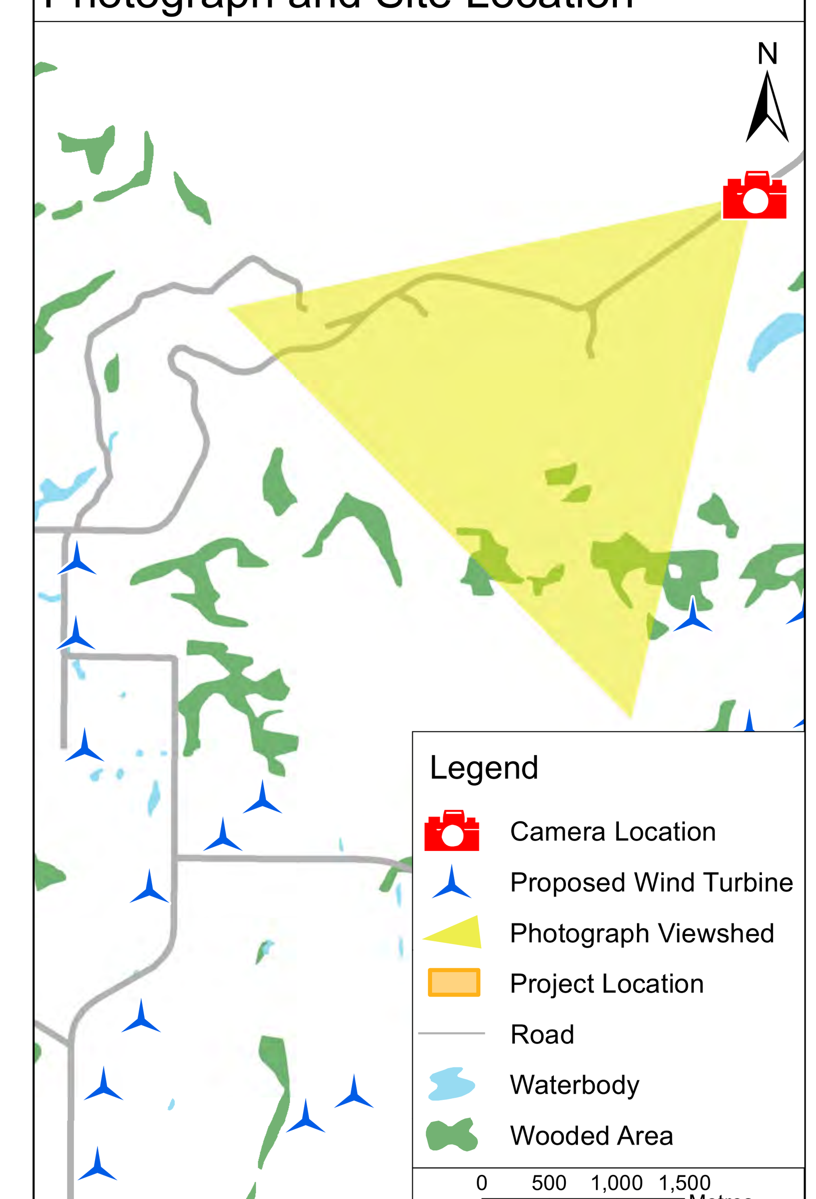

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Sources: Natural Resources Canada.

CanACRE

Photomontage

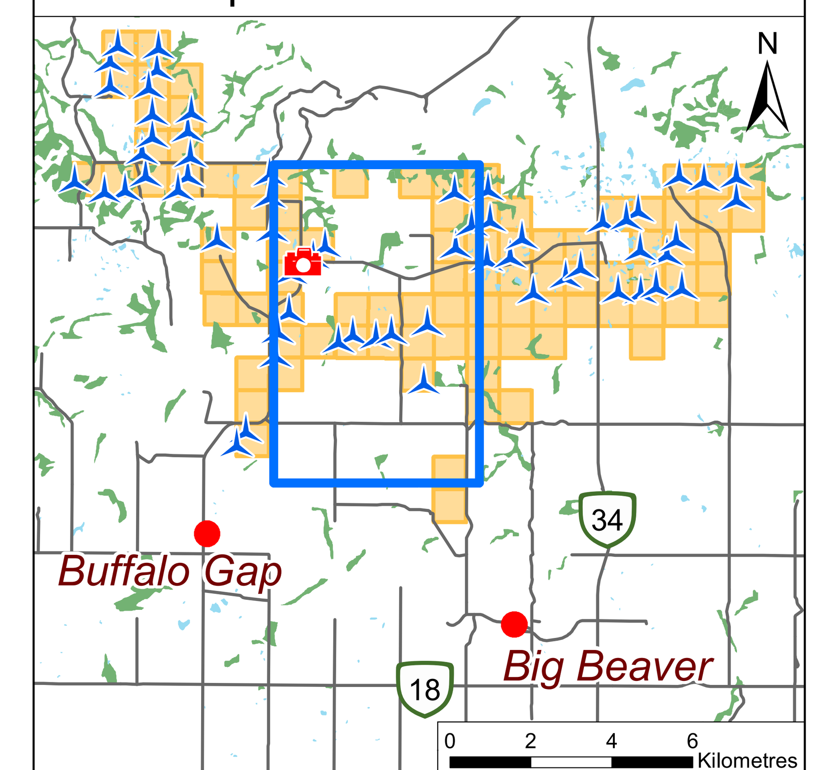
Original Photograph

BluEarth RENEWABLES INC.

Outlaw Trail Wind Project

PHOTOMONTAGE OF PROPOSED 200MW WIND TURBINES FROM VANTAGE POINT 5 WEST OF SITE

Index Map



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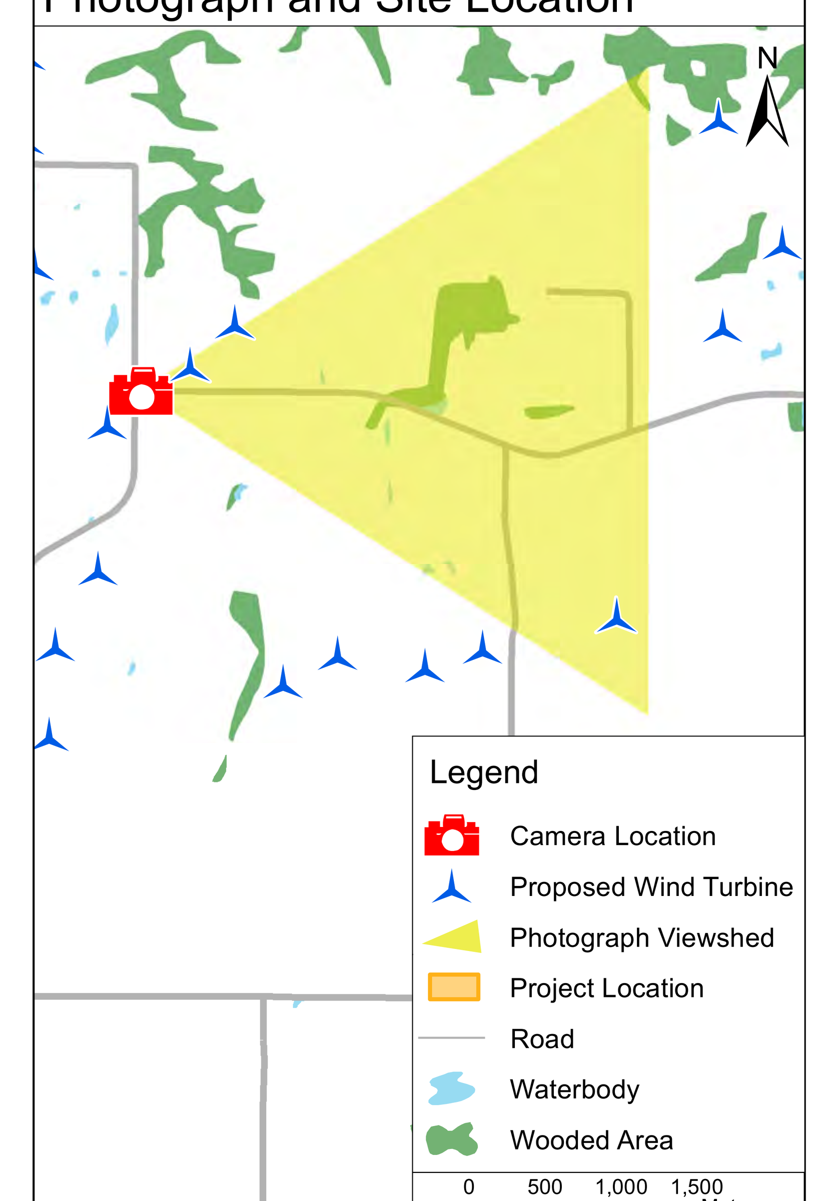

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Sources: Natural Resources Canada.

CanACRE

Map17-0242 - Outlaw Trails 200mw - Vantage Point 5

Photomontage

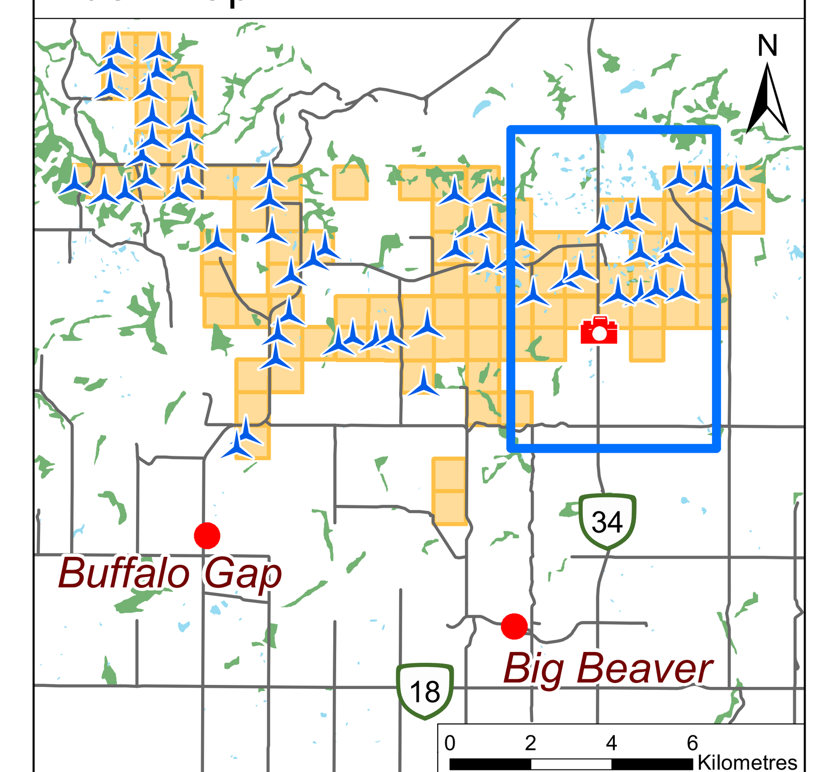
Original Photograph

BluEarth RENEWABLES INC.

Outlaw Trail Wind Project

PHOTOMONTAGE OF PROPOSED 200MW WIND TURBINES FROM VANTAGE POINT 6 EAST OF SITE

Index Map



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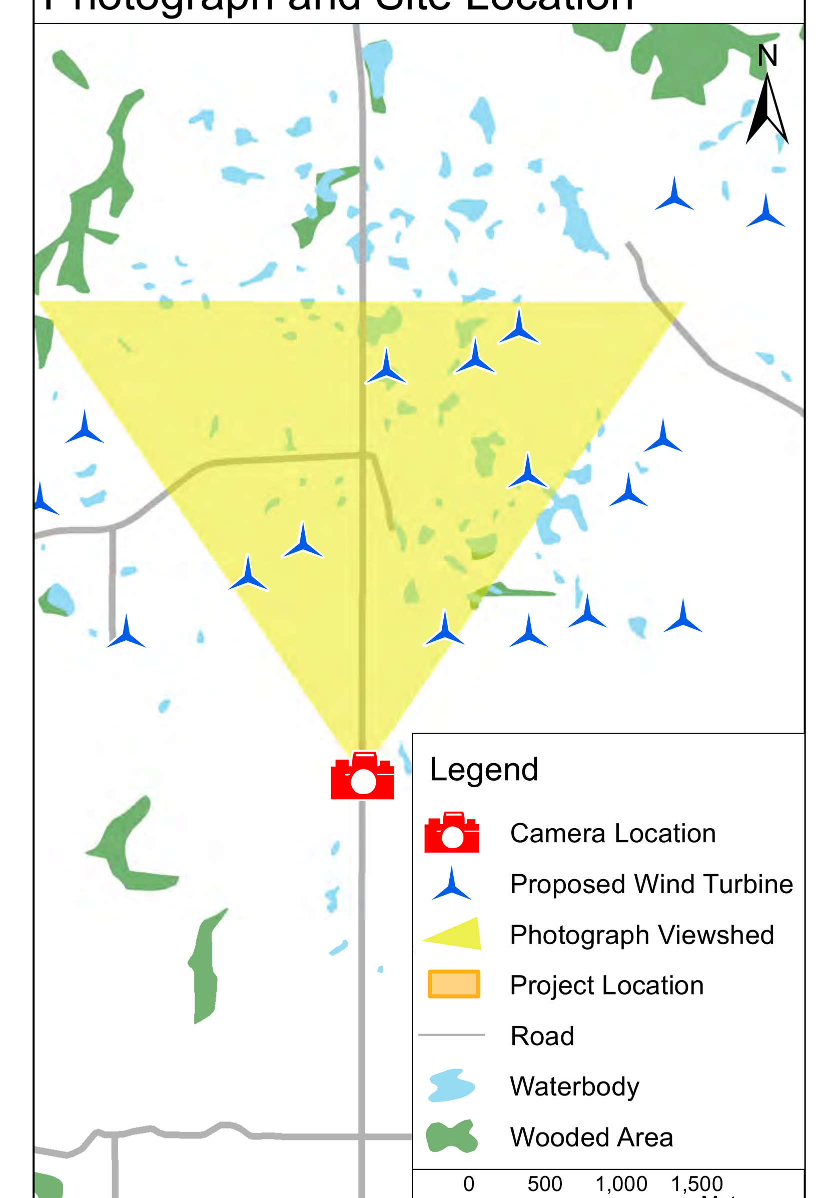

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Sources: Natural Resources Canada.

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BluEarth Renewables Inc.

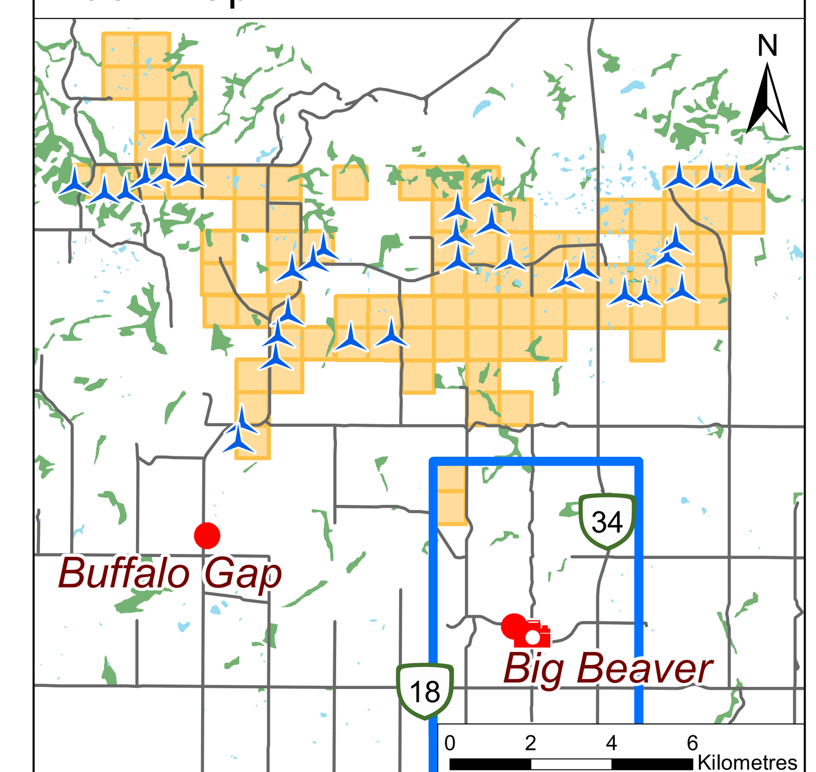
Outlaw Trail Wind Project

PHOTOMONTAGE OF PROPOSED 100MW WIND TURBINES FROM VANTAGE POINT 2 SOUTH OF SITE

Photomontage

Original Photograph

Index Map



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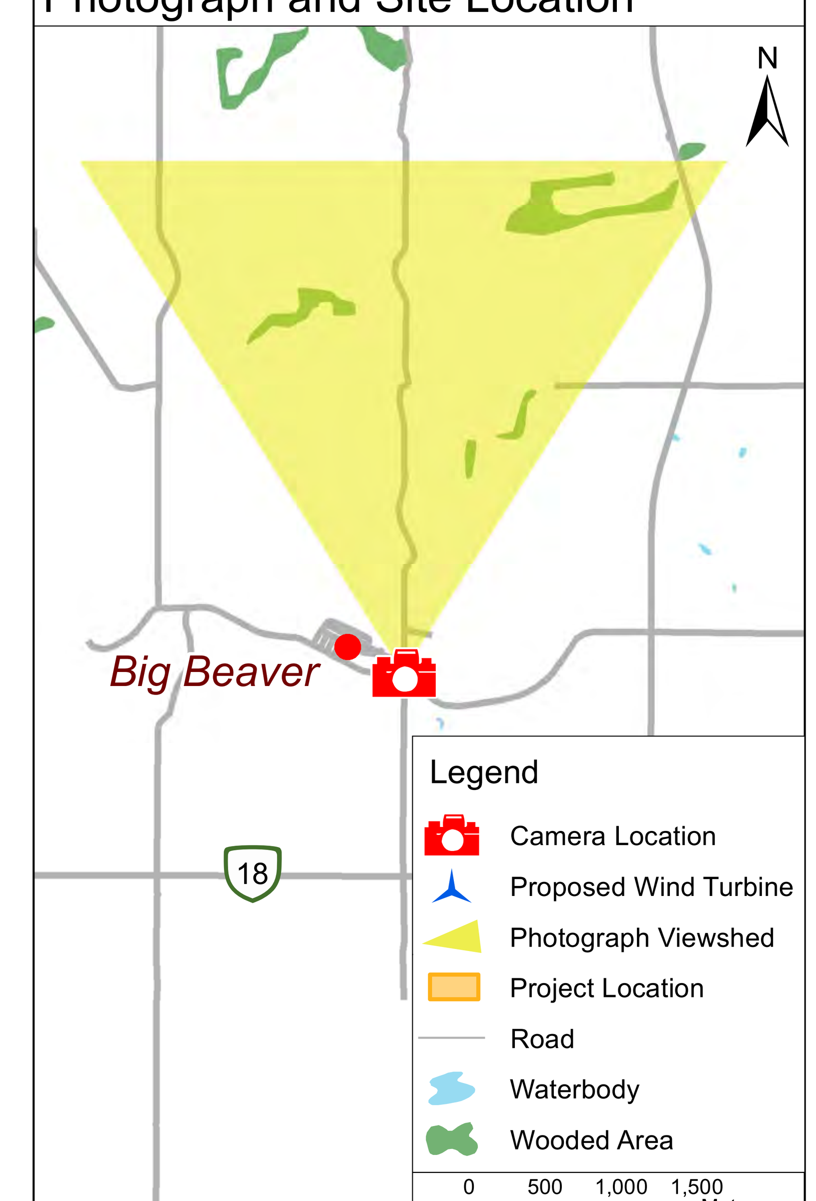

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CanACRE

Photomontage

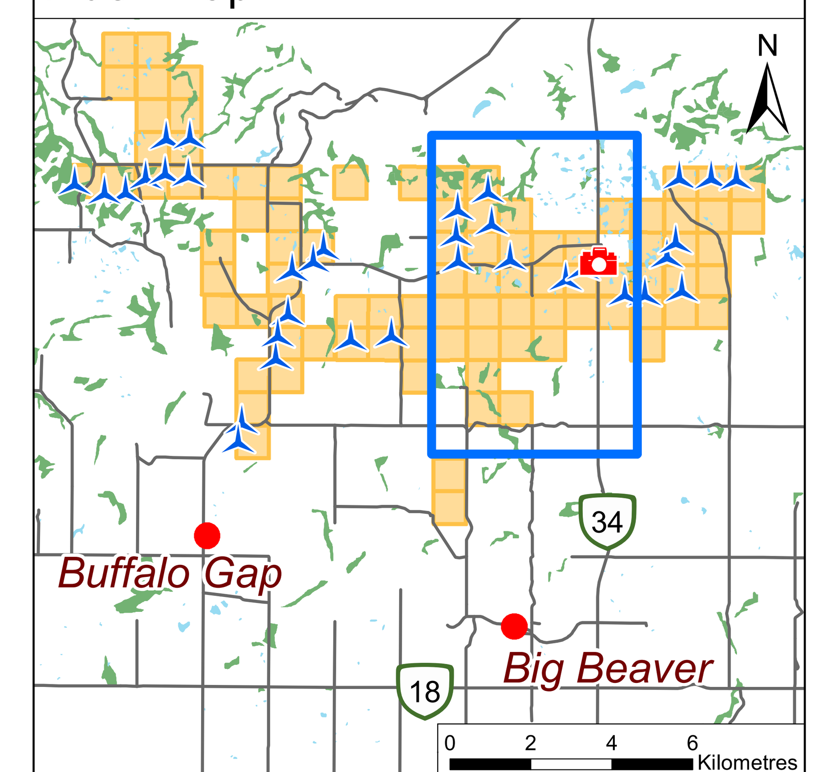
Original Photograph

BluEarth RENEWABLES INC.

Outlaw Trail Wind Project

PHOTOMONTAGE OF PROPOSED 100MW WIND TURBINES FROM VANTAGE POINT 3 EAST OF SITE

Index Map



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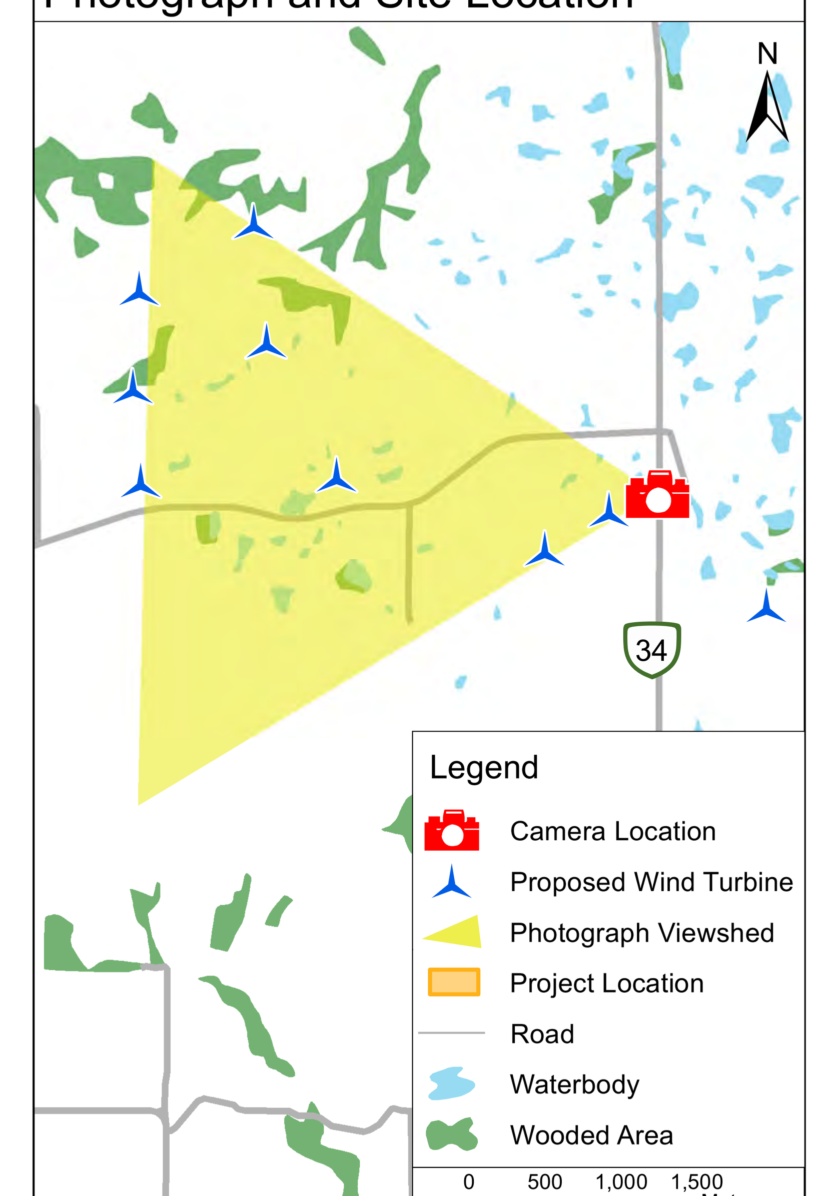

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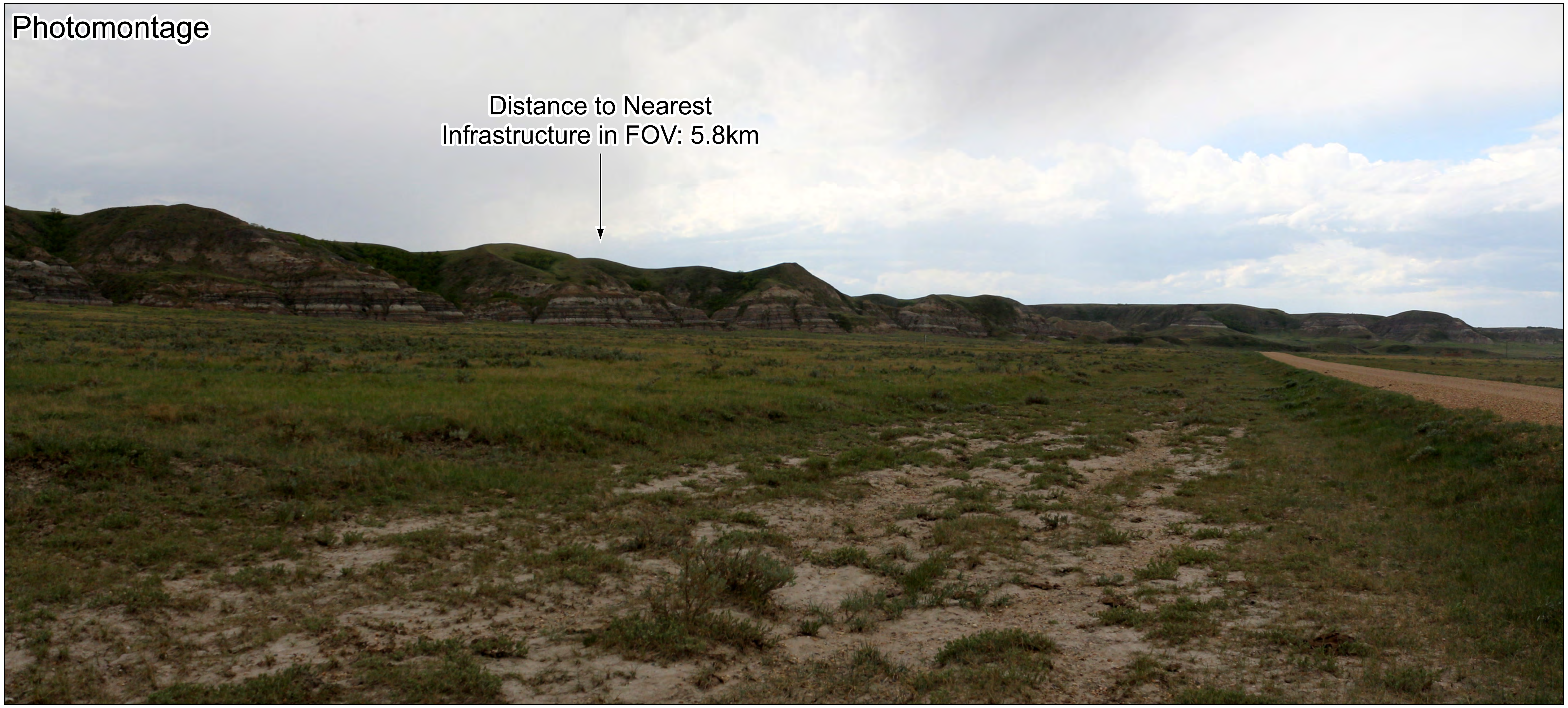
Photomontage



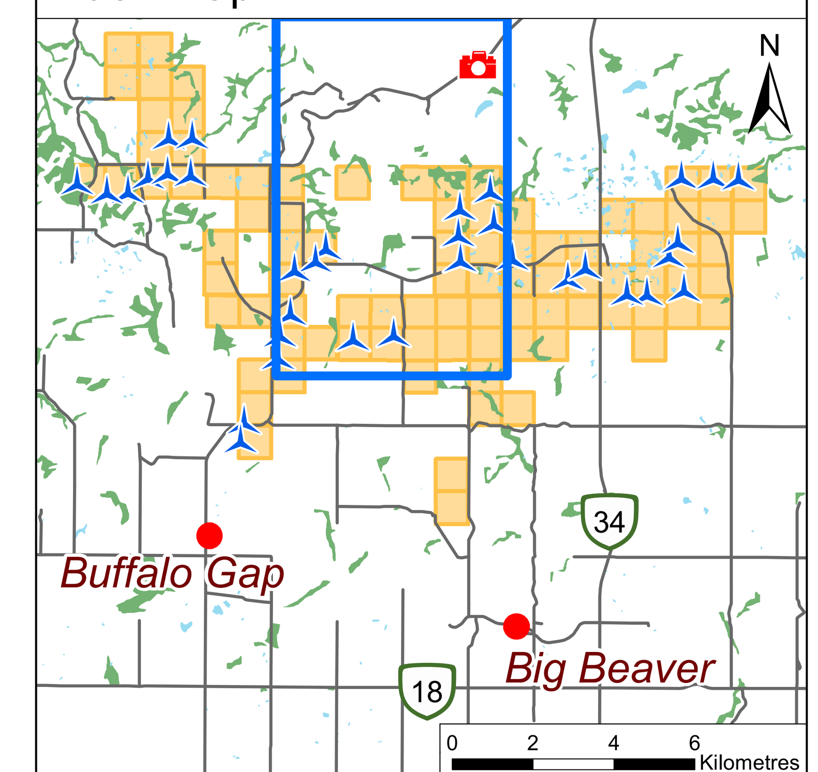
Original Photograph

BluEarth RENEWABLES INC.

Outlaw Trail Wind Project

PHOTOMONTAGE OF PROPOSED 100MW WIND TURBINES FROM VANTAGE POINT 4 NORTH OF SITE

Index Map



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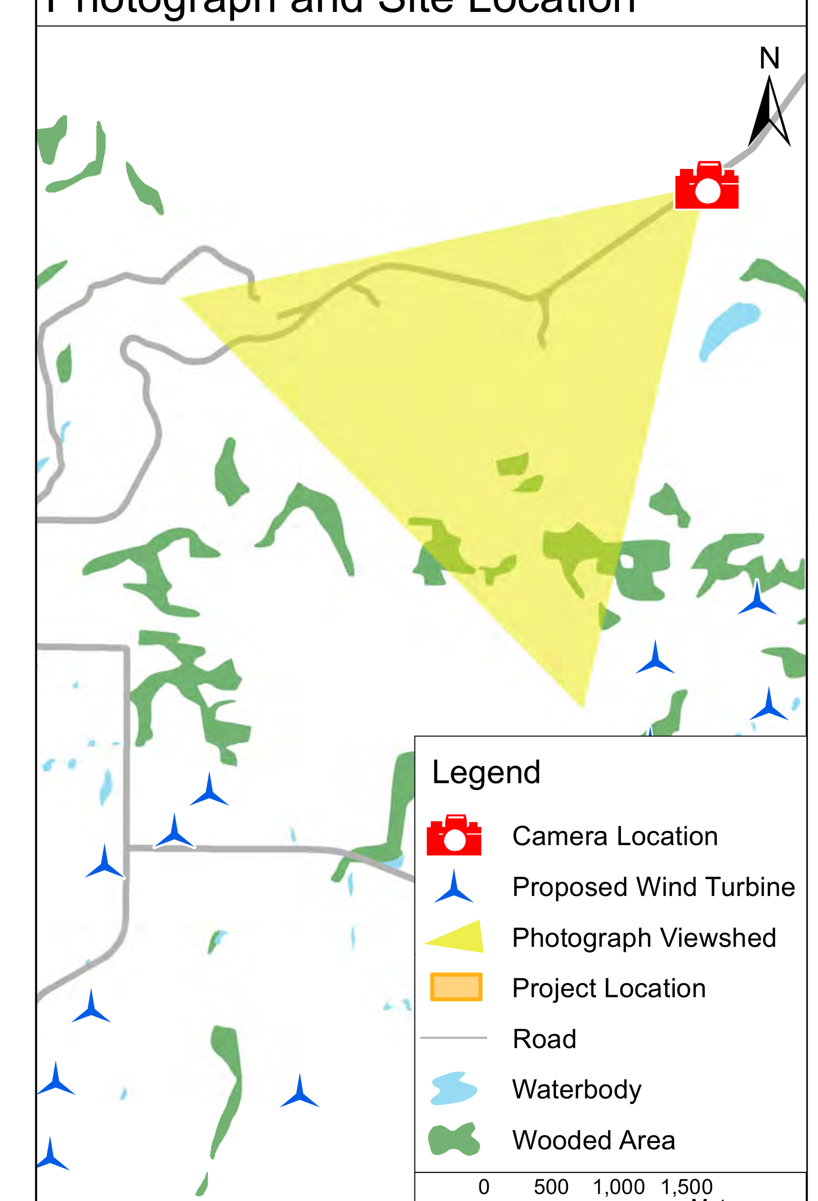

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Sources: Natural Resources Canada.

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Map17-0242 - Outlaw Trails 100mw - Vantage Point 4

Photomontage

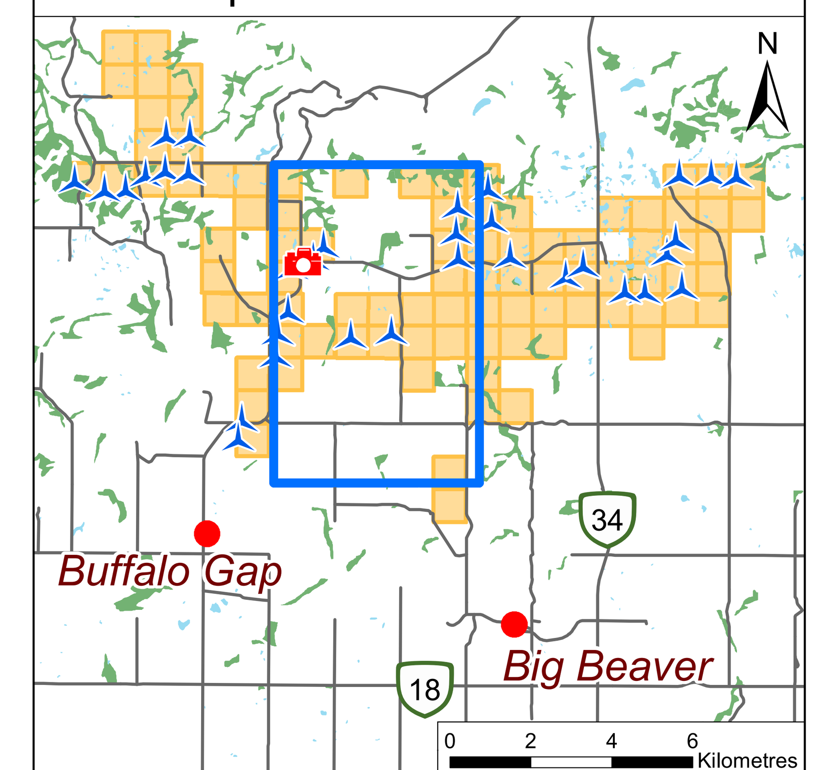
Original Photograph

BluEarth RENEWABLES INC.

Outlaw Trail Wind Project

PHOTOMONTAGE OF PROPOSED 100MW WIND TURBINES FROM VANTAGE POINT 5 WEST OF SITE

Index Map



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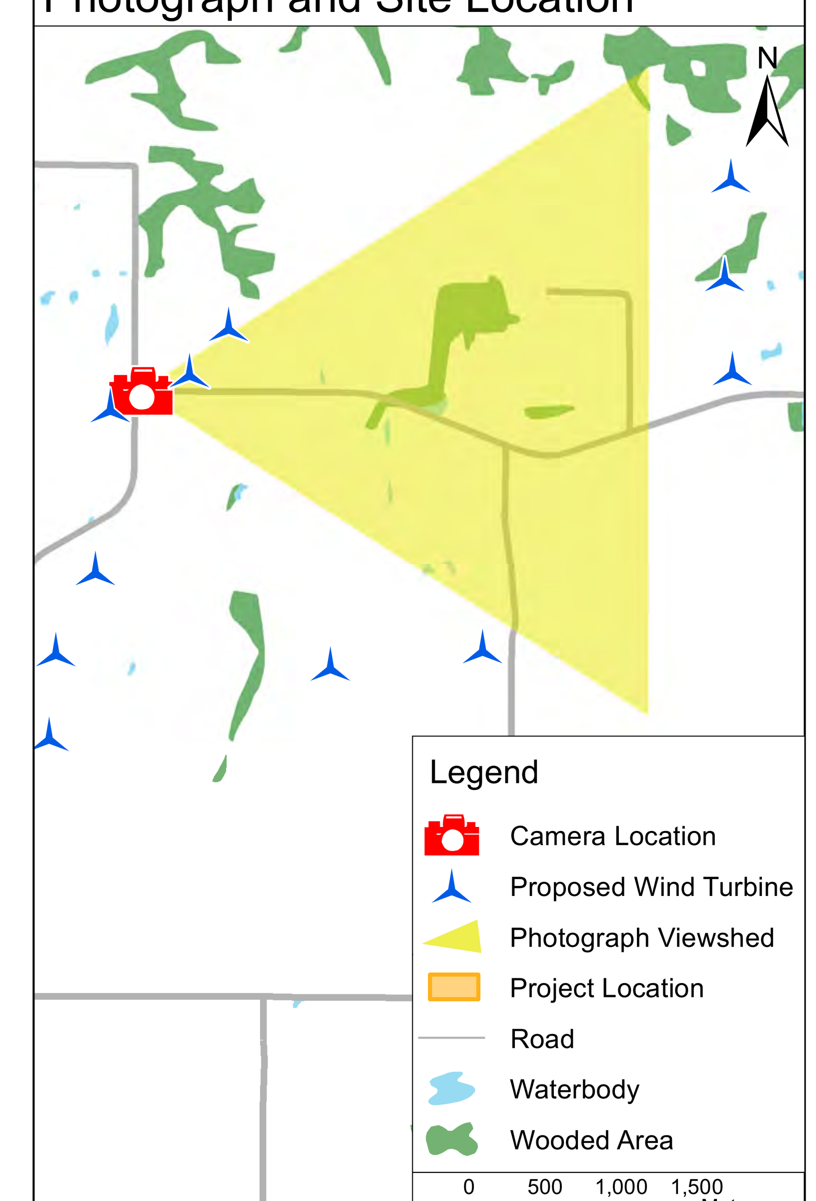

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CanACRE

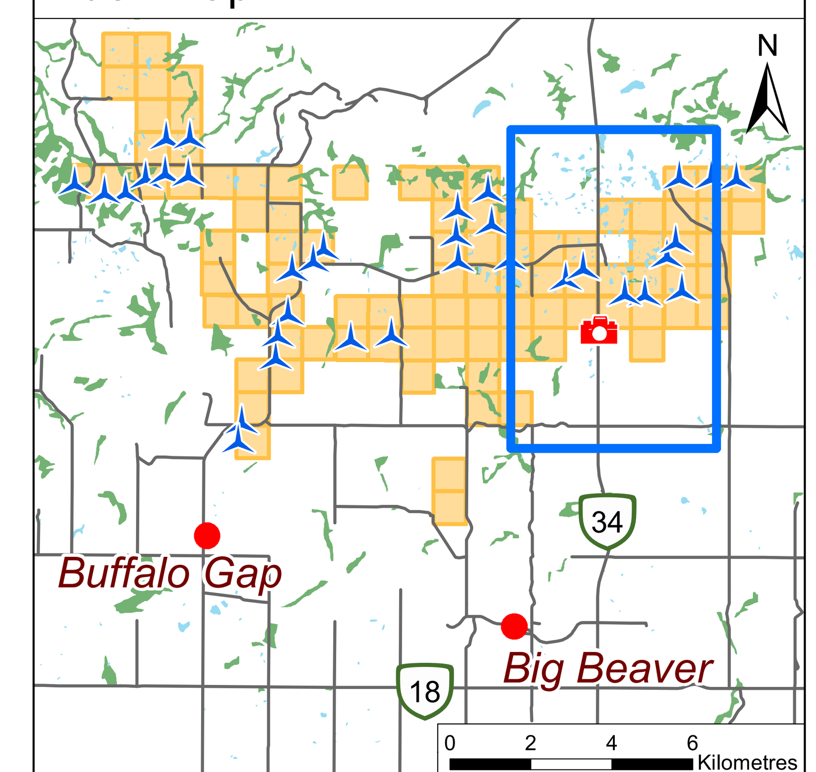
Map17-0242 - Outlaw Trails 100mw - Vantage Point 5

BluEarth RENEWABLES INC.

Outlaw Trail Wind Project

PHOTOMONTAGE OF PROPOSED 100MW WIND TURBINES FROM VANTAGE POINT 6 EAST OF SITE

Index Map



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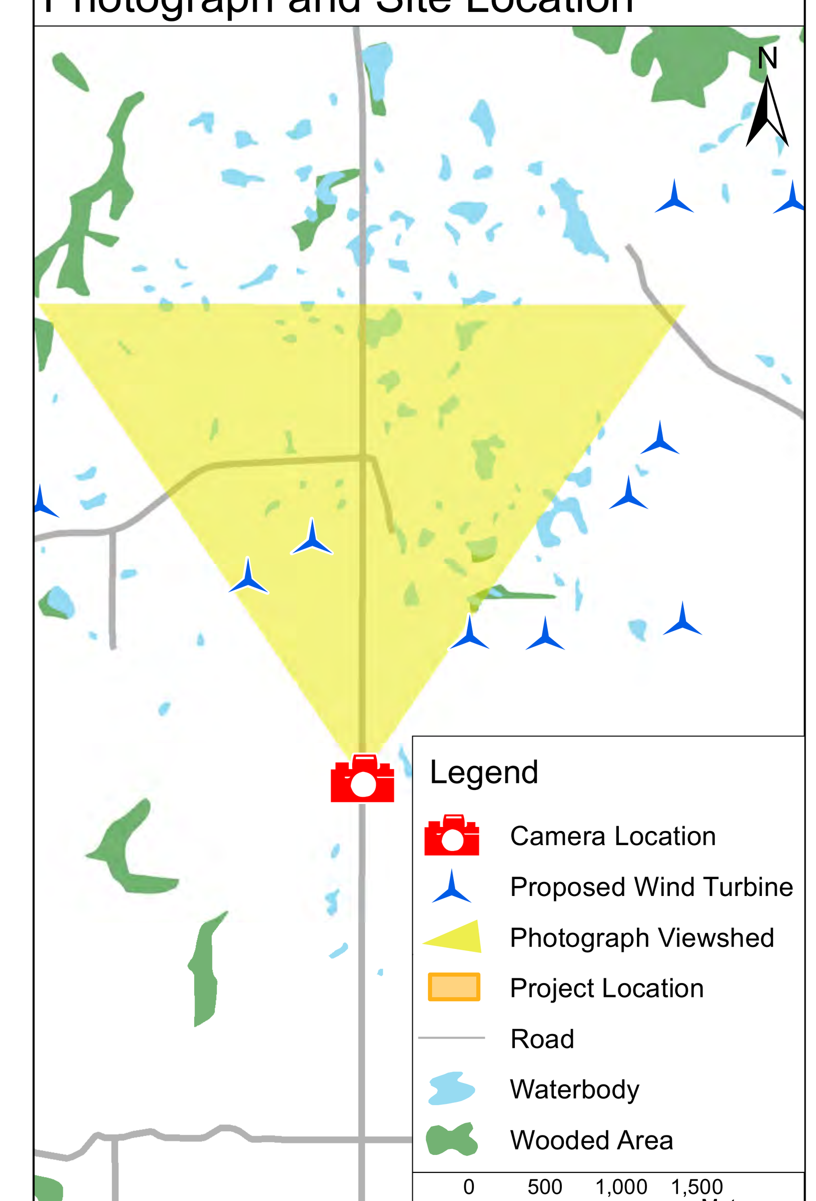

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Sources: Natural Resources Canada.

CanACRE

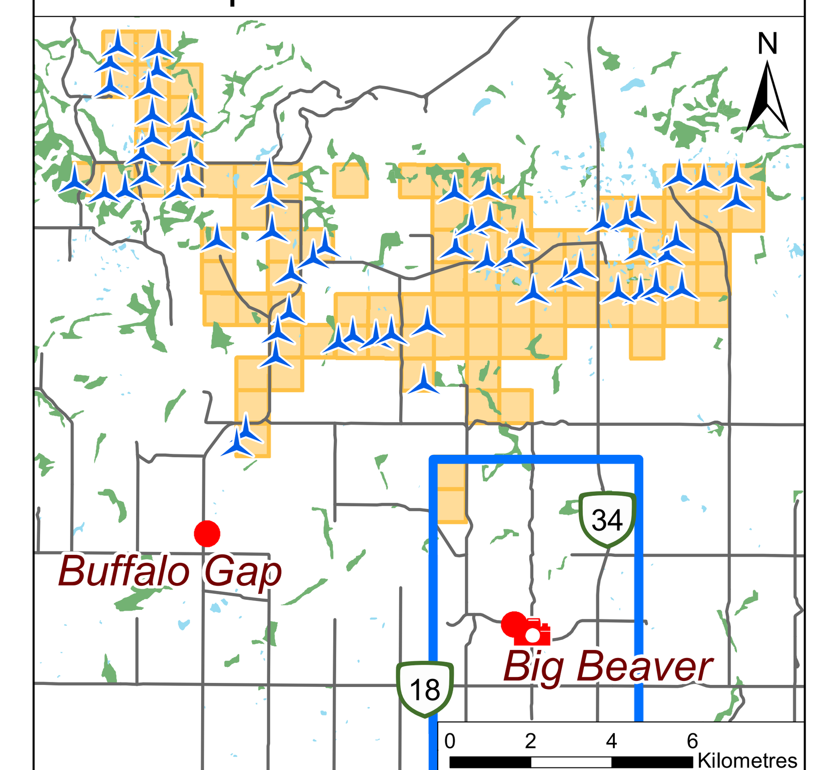
Map17-0242 - Outlaw Trails 100mw - Vantage Point 6

BluEarth RENEWABLES INC.

Outlaw Trail Wind Project

PHOTOMONTAGE OF PROPOSED 200MW WIND TURBINES FROM VANTAGE POINT 2 SOUTH OF SITE

Index Map



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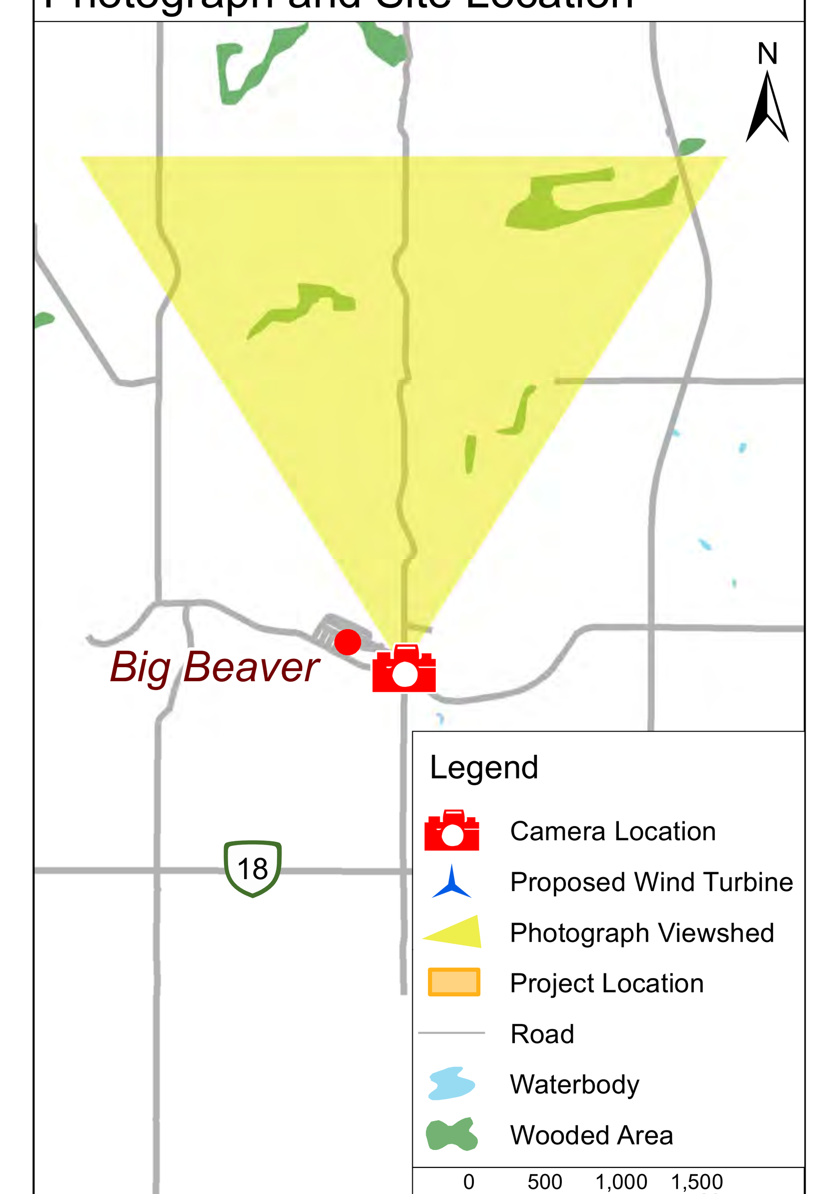

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Projection: NAD 1983 UTM Zone 13N
Sources: Natural Resources Canada.

CanACRE

Map17-0242 - Outlaw Trails 200mw - Vantage Point 2 V2

Appendix F

Noise Impact Assessment Technical Report

Outlaw Trail Wind LP
Outlaw Trail Wind Energy Project
February 2021 - 19-1825

DILLON CONSULTING

75 YEARS

FINAL REPORT

OUTLAW TRAIL WIND POWER PROJECT

BLUEARTH RENEWABLES INC.

NOISE IMPACT ASSESSMENT

RWDI #2003879

January 12, 2021

SUBMITTED TO

Isabelle Deguise
BluEarth Renewables Inc.
200, 4723 1 Street SW
Calgary, Alberta
T2G 4Y8

SUBMITTED BY

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F: 519.823.1316

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APPENDICES

EXECUTIVE SUMMARY

BluEarth Renewables Inc. (BER) is proposing to develop the Outlaw Trail Wind Power Project (OTWPP, or "the Project") approximately 5 km north of Big Beaver, SK. This study assesses the noise impacts from the proposed project on nearby homes. As Saskatchewan does not currently have any noise regulations, the study follows specific guidance outlined for wind power projects by the Alberta Utilities Commission (AUC) under Rule 012: Noise Control (AUC 2019).

The OTWPP will see the development of 33 Siemens Gamesa SG6.0-170 6.2 MW wind turbines totaling approximately 204.6 MW. The OTWPP is applying for 37 permitted wind turbine locations, including 4 alternative wind turbine locations to be latter dropped. This project will also develop a substation with one 224 MVA transformer, which was modelled and considered in this assessment. The AUC Rule 012 approach to noise assessment also requires the inclusion ambient noise and other noise contributions from energy related facilities in a cumulative assessment which have been included where identified.

The results of the predictive modelling indicate that the sound levels from the OTWPP are expected to comply with the AUC Permissible Sound Level limits at residences. The potential for low frequency sound created by the OTWPP is considered to be low.

1 INTRODUCTION

BluEarth Renewables Inc. (BER) is proposing to develop the Outlaw Trail Wind Power Project (OTWPP, or "the Project") approximately 5 km north of Big Beaver, SK. This study assesses the noise impacts from the proposed project on nearby dwellings. As Saskatchewan does not currently have any noise regulations, the study follows specific guidance outlined for wind power projects by the Alberta Utilities Commission (AUC) under Rule 012: Noise Control (AUC 2019).

The OTWPP will see the development of 33 Siemens Gamesa 6.2 MW wind turbines totaling approximately 204.6 MW. The OTWPP is applying for 37 permitted wind turbine locations, including 4 alternative wind turbine locations which will be dropped upon the final considered design layout. This project will also develop a substation with one 224 MVA transformer, and which is modelled and considered in this assessment. The AUC Rule 012 approach to noise assessment also requires the inclusion ambient noise and other noise contributions from energy related facilities in a cumulative assessment which have been included where identified.

A noise model was generated, and compliance determined according to the cumulative noise level approach specific for wind power projects as outlined in AUC Rule 012. All work was completed by technical staff experienced in acoustic assessment, as detailed in Appendix A.

2 ASSESSMENT APPROACH

Noise from the OTWPP has been estimated using predictive modelling to determine the impact at the nearest dwellings. The assessment was completed by:

- Identifying dwellings per Rule 012;
- Determining the applicable ambient sound levels and Permissible Sound Levels (PSL) for dwellings per Rule 012;
- Estimating noise levels from energy-related facilities affecting dwellings;
- Estimating sound emissions from the OTWPP;
- Modelling sound emissions to predict noise levels at dwellings; and,
- Comparing results to the Rule 012 PSLs.

This report details the methods and model used in the noise assessment.

2.1 Environmental Noise Descriptors

As environmental noise varies over time, a single number descriptor known as the Energy Equivalent Sound Level or L_{EQ} is used to quantify noise. The L_{EQ} value, expressed in dBA, is the energy-averaged A-weighted sound level for a specified time period. It is defined as the steady continuous sound level, over a specified time period, that has the same acoustic energy as the actual varying sound levels occurring over the same time period. The L_{EQ} values are reported as A-weighted sound levels expressed in units of dBA (A-weighted decibels). The A-weightings are assigned to account for the frequency response of the human ear, which is most sensitive to mid-frequency sounds. The L_{EQ} in dBA is the primary sound level criteria addressed by AUC criteria. An additional measure used by the AUC is the L_{90}. The L_{90} is a statistical measurement for a sound level that is exceeded 90 per cent of the time.

Rule 012 has different allowable sound levels for daytime, which it defines as 07:00 to 22:00 hours, and nighttime, which it defines as 22:00 to 07:00 hours. The L_{EQ} during daytime periods is the 15-hour A-weighted energy equivalent sound level and is denoted as the $L_{EQ\ Day}$. Similarly, the L_{EQ} during nighttime periods is a 9-hour A-weighted energy equivalent sound level and is denoted as the $L_{EQ\ Night}$.

In addition to assessing A-weighted L_{EQ} sound levels, Rule 012 recommends that low frequency noise (LFN) be assessed at the NIA stage where data is available. LFN is measured using C-weighted L_{EQ} sound levels, expressed in dBC, which represent a nearly flat frequency response. The C-weighted levels are a better indicator than A-weighted levels for potential disturbance caused by high levels of LFN. Rule 012 assesses the potential for LFN complaints based on the difference between the dBC and dBA levels, and whether there is tonality of the sound within the LFN frequencies.

A detailed glossary of terms is provided in Appendix B to aid the non-technical reader.

2.2 Computer Modelling

Modelling for this assessment was conducted using CadnaA (Version 2020 MR1 build 181.5100) sound level prediction software set to use the environmental sound propagation calculation methods prescribed by the ISO Standard 9613 (ISO 1993, 1996). The ISO 9613 sound propagation method predicts sound levels under moderately developed temperature inversion and downwind conditions, which enhance sound propagation to the dwelling. The evaluation was based on typical summertime weather conditions, as outlined in Rule 012. Table 1 describes the configuration of the calculation parameters used to complete the noise modelling.

Table 1: Model Configuration Parameters

Parameter	Model Settings	Description/Notes
Calculation Standard	ISO 9613 only	All sources and attenuators treated as required by the cited standard.
Source Directivity	Vertical sources applied to larger structures	Directivity of the source emission and the barrier effect of buildings, if present.
Ground Absorption	0.7 (index value 0 to 1)	Values used for mixed, but soft ground. Applied to the entire modelling domain.
Temperature and Humidity	10°C/70% Relative Humidity	Average summer conditions for area.
Wind Conditions	Default ISO 9613	The propagation conditions in the ISO 9613 (1996) standard are valid for wind speeds between 4 and 18 km/h; all points are considered downwind.
Terrain	Terrain applied	Terrain in the area is modelled at 2 m vertical resolution to account for any natural barriers within the study area (CDED 2009).
Reflections	1	One reflection is taken into account for reflections from on-site structures, if present
Search Radius	5000 m	All sources within this radius of a dwelling or grid point are calculated.

3 STUDY AREA AND DWELLINGS

Rule 012 defines a noise-sensitive receptor as any permanent or seasonally occupied dwelling within 1.5 km of a facility, or with wind farms, 1.5 km of the turbine base. Therefore, a 1.5 km boundary from each turbine has been created, with overlapping boundaries merged to create a continuous 1.5 km boundary for the OTWPP. This study area defines the dwellings that are considered in the noise impact assessment; specifically, any dwellings that lie within this boundary are evaluated.

A combined approach was used to verify dwelling dwellings, which included a desktop search of mapping for presence of structures, then onsite field observations to verify locations with homes. Table 2 indicates the dwellings that are within the 1.5 km boundary from the turbines, and which will be evaluated. Table 2 also indicates the distance and direction to the nearest OTWPP turbine.

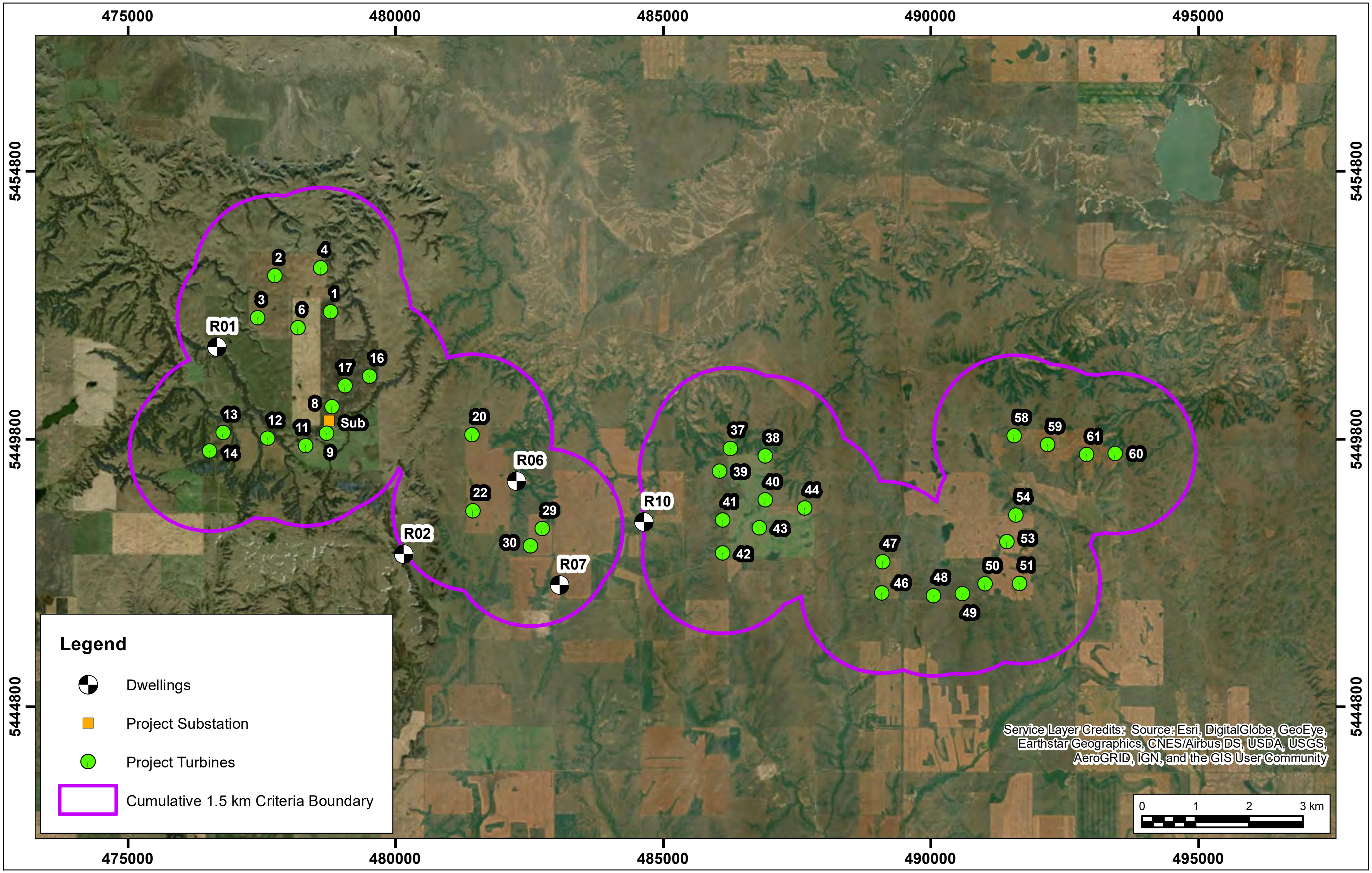
As per AUC Rule 012 the assessment considers the number of stories for each dwelling as provided by BER. Single storey homes have been modelled at a height of 1.5 m while two storey homes have been modelled at 4.5 m, as shown in Table 2.

Other third party facilities that may contribute to noise at dwellings must be evaluated along with the Project sound sources, and depending on the cumulative potential, may require the inclusion of dwellings farther than 1.5 km from the turbines. No active third party oil and gas facilities were located within the Project area (Section 5.2) so no additional dwellings required inclusion. Details regarding the desktop and field survey for other energy related facilities are further discussed in Section 5.1.

Figure 1 shows the 1.5 km Criteria Boundary, as well as the locations of the dwellings.

Table 2: Location of Dwellings and Spatial Locations from Nearest Turbine

Dwelling ID	Within 1.5 km of turbine?	UTM Coordinates (NAD 83, Zone 12)		Modelled Height (m)	Distance to Nearest OTWPP Turbine (m)	Nearest OTWPP Turbine ID	Angle to Nearest Turbine (0º as North)
		Easting (m)	Northing (m)				
R01	Y	476654	5451529	4.5	934	WT - 3	54
R02	N	480143	5447656	1.5	1532	WT - 22	58
R06	Y	482252	5449017	1.5	979	WT - 22	236
R07	Y	483055	5447078	4.5	904	WT - 30	324
R10	Y	484632	5448256	4.5	1474	WT - 41	89



Outlaw Trail Wind Power Project

Detailed Project Location, Dwellings, and Cumulative 1.5 km Criteria Boundary

Map Projection: NAD 1983 UTM Zone 13N

BluEarth Renewables Inc. - Saskatchewan

True North

Project #: 2003879

Drawn by: KAMH	Figure: 1
Approx. Scale:	1:100,000
Date Revised:	Dec 23, 2020

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4 RULE 012 CRITERIA

4.1 Ambient Sound Levels

AUC Rule 012 requires the consideration of ambient levels in the determination of PSLs and compliance of proposed projects. In areas where the assumed ambient described in Table 1 of Rule 012 is not representative of an area, measured values may be used in establishing the PSLs such as areas meeting the definition of 'pristine' in the rule or may be influenced by non-noise regulated development. The Project area does not meet the definition of pristine according to Rule 012, which states:

> A natural area that might have a dwelling but no industrial presence, including energy, agricultural, forestry, manufacturing, recreational or other industries that affect the noise environment.

The project area is typical of rural Saskatchewan, primarily agricultural land use with some energy industry development (as further described in Section 5.1). This support the application of the assumed ambient sound levels determined through Table 1 of AUC Rule 012. All of the identified dwellings will have assumed ambient sound levels which are 5 dB less then the identified BSL.

For this project all dwellings have the lowest assumed ambient levels of 45 dBA and 35 dBA for daytime and nighttime hours respectively, which is based on the BSL determined in Section 4.2.

4.2 Permissible Sound Level Determination

The requirements of Rule 012 limit the amount of sound contribution at a dwelling location that may be generated by facilities. The sound level limits for a dwelling are set by calculating permissible sound levels (PSLs) according to the procedures in Rule 012. Where dwellings are present, the PSL is determined using a Basic Sound Level (BSL) plus any allowed adjustments. Where no special conditions exist, the PSL is determined as follows:

Permissible Sound Level	=	Basic Sound Level (Table 1 in Rule 012)	+	Daytime Adjustment (If applicable)

The BSL is determined based on dwelling density and proximity to heavily travelled roadways. All dwellings are rural residences with a dwelling density of less than 8 dwellings per quarter section, and the resulting PSL is 40 dBA for nighttime and 50 dBA for daytime. A summary of the PSLs is provided in Table 3.

Where no permanent or seasonally occupied human dwelling exists within a distance of 1.5 km from the OTWPP, Rule 012 requires that the cumulative sound level at 1.5 km from the OTWPP "fenceline" not exceed 40 dBA L_{EQ} during nighttime hours. Five dwellings have been identified, so no Criteria Boundary dwellings are identified.

Regarding LFN, Rule 012 states that a complaint condition may exist where the difference between the OTWPP's time weighted average dBA and dBC levels is equal to or greater than 20 dB, and where a clear tonal component exists at a frequency below 250 Hz.

Table 3: PSL Determination (Rule 012 – Table 1)

Dwelling ID	Proximity to Transportation Category[1]	Dwelling Density per Quarter Section of Land [2]	Dwelling Category [3]	Nighttime BSL[4]	Permissible Sound Level	
					Night[5] (dBA)	Day [6] (dBA)
R01	1	1 to 8 dwelling	1	40	40	50
R02	1	1 to 8 dwelling	1	40	40	50
R06	1	1 to 8 dwelling	1	40	40	50
R07	1	1 to 8 dwelling	1	40	40	50
R10	1	1 to 8 dwelling	1	40	40	50

Notes: 1 - Category 1 dwelling units are more than 500 m from heavily travelled roads and/or rail lines and not subject to frequent aircraft flyovers (AUC, 2013).
2 - Density per quarter section refers to a quarter section with affected dwellings at the center (a 451m radius). For quarter sections with various land uses or with mixed densities, the density chosen is averaged for the area under consideration (AUC, 2019).
3 – As identified per Table 1 of AUC Rule 012.
4 - Basic sound level as identified per Table 1 of AUC Rule 012.
5 - Nighttime PSL is equal to the BSL as there are no A, B, or C adjustments.
6 - Daytime PSL is equal to the BSL plus the 10 dBA daytime adjustment, as there are no A, B, or C adjustments.

5 EXISTING CONDITIONS

5.1 Third Party Facilities

AUC Rule 012 requires that a cumulative assessment be considered for the development of any energy related facilities. The cumulative assessment must include the contributions from other third party existing and approved facilities. While the province of Saskatchewan does not have noise regulations directly applicable to other industry, noise is a factor considered in the environmental evaluation of projects, where warranted. Therefore, this assessment considered other energy or industrial noise sources in the cumulative assessment, consistent with the intent of AUC Rule 012.

Third party facilities within the project boundaries are expected to be sources that may affect sound levels at dwellings. These sound sources need to be considered in the turbine layout design, and subsequently would be used to establish cumulative noise effects as required for Noise Impact Assessments under Rule 012.

Third party facilities were identified using publicly available data sources for Saskatchewan and through field observation. The data sources come from the listings provided by the National Pollutant Release Inventory (NPRI 2016), and the government of Saskatchewan mining and petroleum GeoAtlas database (SMOE 2017). The data sources are used to identify typical facilities that may contribute sound to the wind projects and must be considered in future noise impact assessments per Rule 012.

The desktop survey resulted in the identification of sixteen potential third party facilities within the project area; however, all facilities were noted in the database as abandoned wells previously used for testing and exploration. The Saskatchewan GeoAtlas also lists no oil and gas land claims in the Project area. A field survey confirmed that no noise sources were present on these sites. No third party facilities required inclusion in this assessment.

6 PREDICTION RESULTS

6.1 Noise Sources

The OTWPP will consist of 37 Siemens Gamesa 6.2MW wind turbines at a hub height of 100 m. The sound power level for the wind turbines is taken from the Siemens Gamesa supplied acoustic specifications. The turbine reaches a maximum sound output of 106 dBA at 9 m/s hub height wind speed. The manufacturer supplied specifications provided does not present octave band data at the maximum sound output occurring at 9m/s. For modelling purposes, RWDI scaled the 8 m/s octave band data to the maximum sound output of 106 dBA.

The equivalent standardized wind speed (speed at a height of 10 m) is 7.7 m/s for the Siemens Gamesa SG6.0-170 6.2 MW at 100 m hub height. Calculated wind speed at a standardized height of 10 m are determined in accordance with IEC 61400-11 (IEC 2012). Acoustic sound power specifications for the turbine are presented in Appendix D.

The turbines were modelled at the proposed hub height of 100 m elevation above grade and assumed continuous operation over the day and night periods.

The Project will also include a substation, consisting of one 224 MVA ONAF transformers. The substation has been modelled as running a full capacity 24/7.

Table 4 shows the sound power level for each substation, and for the wind turbines used in the noise model.

Table 4: Project Sound Power Levels

Item	Qty	UTM Coordinates (NAD 83, Zone 12)		Levels at Octave Band Center Frequencies (dB)									Overall Sound Power		Source
		Easting (m)	Northing (m)	31.5	63	125	250	500	1,000	2,000	4,000	8,000	(dBA)	(dB)	
Outlaw Wind Power Substation Transformer (224 MVA)	1	478756	5450145	100.1	106.1	108.1	103.1	103.1	97.1	92.1	87.1	80.1	103.5	112.1	(1)
Siemens Gamesa SG6.0-170, 6.2 MW @ 9 m/s hub height wind speed	37	(1)	(1)	113.1	113.7	110.4	105.1	100.7	100.7	99.2	94.9	85.2	106	117.9	(2)

Notes: 1 - Derived using theoretical calculations based on power ratings, dimensions, and capacities provided by the client (Crocker 2009).
2 –Wind Turbine locations provided in Appendix C.

6.2 Operation Results

6.2.1 Assessment of Compliance with Standard AUC Rule 012 PSL

Table 5 and Table 6 show the compliance determination with the daytime and nighttime PSLs, respectively, according to the standard AUC Rule 012 outline. The results indicate that the OTWPP will comply with the PSLs.

Figure 2 shows the predicted noise contours due to the OTWPP. As there is no operational difference between daytime and nighttime operation, the figure shows the overall predicted sound contours independent of time.

Table 5: Assessment of Compliance with Daytime PSLs

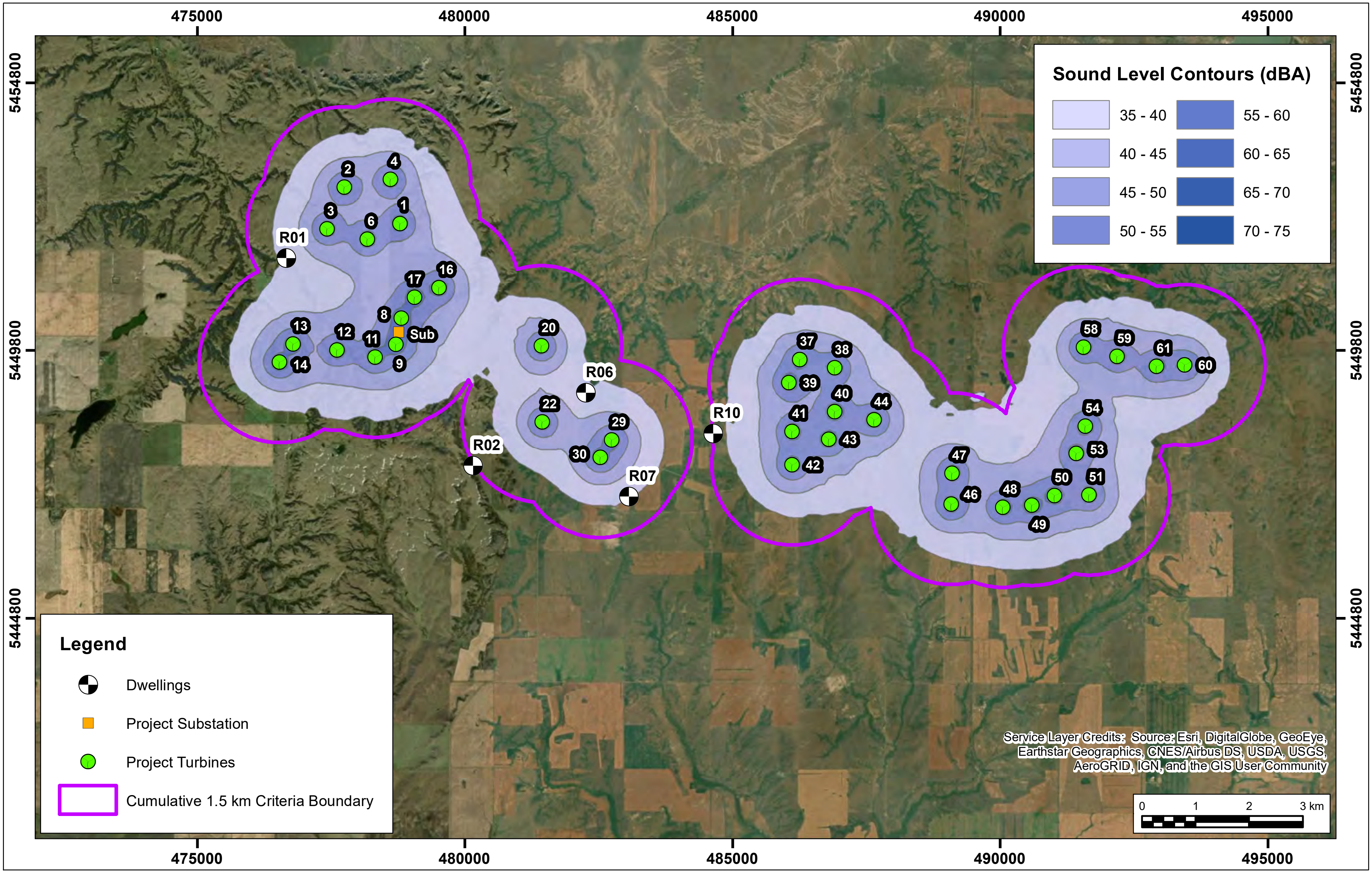
Dwelling ID	Mandated Ambient Sound Level[1] (dBA)	Proposed Project Contribution (dBA)	Cumulative Sound Level[2] (dBA)	PSL[3] (dBA)	Complies with AUC Rule 012? (Y/N)
R01	45	36.4	45.6	50	Y
R02	45	28.4	45.1	50	Y
R06	45	35.3	45.4	50	Y
R07	45	35.4	45.5	50	Y
R10	45	33.9	45.3	50	Y

Notes: 1 - Ambient sound level as outlined by AUC Rule 012, Table 1.
2 - The cumulative sound level is the logarithmic sum of mandated ambient and the project contribution.
3 - Permissible sound level as outlined by AUC Rule 012.

Table 6: Assessment of Compliance with Nighttime PSLs

Dwelling ID	Mandated Ambient Sound Level[1] (dBA)	Proposed Project Contribution (dBA)	Cumulative Sound Level[2] (dBA)	PSL[3] (dBA)	Complies with AUC Rule 012? (Y/N)
R01	35	36.4	38.8	40	Y
R02	35	28.4	35.9	40	Y
R06	35	35.3	38.2	40	Y
R07	35	35.4	38.2	40	Y
R10	35	33.9	37.5	40	Y

Notes: 1 - Ambient sound level as outlined by AUC Rule 012, Table 1.
2 - The cumulative sound level is the logarithmic sum of mandated ambient and the project contribution.
3 - Permissible sound level as outlined by AUC Rule 012.



Outlaw Trail Wind Power Project

Predicted Noise Contours - Project Only

Map Projection: NAD 1983 UTM Zone 13N

BluEarth Renewables Inc. - Saskatchewan

True North

Project #: 2003879

Drawn by:KAMH	Figure: 2
Approx. Scale:	1:100,000
Date Revised:	Dec 23, 2020

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6.3 Low Frequency Noise

The C-Weighted sound level (dBC) results generated by the OTWPP have been reviewed for the dwellings to determine if there is potential for LFN due to the Project. The first part of the definition of LFN reviews the difference between C-weighted and A-weighted sound levels from the Project.

Table 7: Low Frequency Noise Potential

Dwelling ID	C-Weighted Sound Level	A-Weighted Sound Level	dBC-dBA
R01	53.2	36.3	16.9
R02	47.7	28.3	19.4
R06	53.1	35.3	17.8
R07	51.9	35.4	16.5
R10	51.5	33.9	17.6

The daytime dBC-dBA values are below 20 for all dwelling locations. Potential for LFN noise from the transformer is considered low for the Project. The nearest dwelling R07, has a dBC-dBA value of 16.5 dB, and the greatest difference is 19.4 dB. Therefore, the project has a predicted low risk for a complaint due to LFN.

7 CONSTRUCTION NOISE

AUC Rule 012 requires Licensees to manage the impact of construction noise. Construction plans are not available at this stage of Project design; so quantitative effects are not known. BER will consider construction-generated noise in its execution plans and through the consultation program, including the following measures identified in Rule 012:

a) Conduct construction activity between the hours of 7 a.m. and 10 p.m., where practical
b) Advise nearby residents of significant noise-causing activities and schedule these events to reduce disruption to them
c) Ensure that all internal combustion engines are well maintained with muffler systems

8 CONCLUSIONS

This assessment was completed using the cumulative methods and criteria as set out in AUC Rule 012: Noise Control. The results show that cumulative noise levels including the OTWPP will comply with PSL limits at residences as calculated using AUC Rule 012 guidelines.

The low frequency analysis showed no dBC-dBA values were greater than 20 dB. Therefore, the potential for a low frequency noise issue or complaint is low. The analysis also provides guidance for controlling noise during the construction phase of the Project.

9 REFERENCES

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APPENDIX A

APPENDIX A: PRACTITIONER BIOGRAPHIES

Teresa Drew, B.Sc., INCE. Technical Director

Teresa joined RWDI in 2011 as a Senior Consultant/Technical Director for the Noise group in the Calgary office. Teresa is an accomplished professional with over 25 years of consulting experience, focused on the acoustic environment. She has extensive experience in project management, acoustic & environmental consulting, environmental impact assessments and industrial permit applications. The skills Teresa has acquired in the acoustics field have allowed her to play a prominent role in both domestic and international projects for multiple industries.

Her experience in the wind power industry includes applications, noise predictions, and compliance monitoring and policy development. She has lead the technical studies for provincial (Alberta and British Columbia) power project approvals as well as provided expert testimony at federal, provincial and municipal level hearings.

Daniel Kremer, M.Sc., E.I.T. Intermediate Scientist/Engineer.

Daniel joined RWDI in 2013 as a Noise & Vibration Scientist specializing in environmental noise. He has completed many environmental noise studies for regulatory compliance in Alberta and British Colombia. His work has focused on long-term monitoring programs, sound source measurements and predictive modelling for noise and acoustics to support regulatory requirements (AUC Rule 012, AER Directive 038).

His experience is focused on environmental noise related to energy, oil & gas, and mining applications in Western Canada and includes oil sands mining, in-situ oil sands projects, conventional oil and gas extraction, and wind turbine projects. His expertise has been to model and develop noise strategies for large scale projects for future developments at the provincial and federal levels.

Daniel has experience in the planning and post construction stages of wind power development, and in providing analysis and reporting to meet regulatory requirements (AUC Rule 012). He has provided detailed analysis on the relationships between meteorological conditions and turbine operating parameters, and the effects at receptors, including conducting comprehensive post-construction sound level surveys for wind turbines.

APPENDIX B

APPENDIX B: ENVIRONMENTAL NOISE DESCRIPTORS AND TERMINOLOGY

Abnormal noise events

Noises that are sufficiently infrequent as to be uncharacteristic of an area or that occur so close to the microphone as to dominate the measurements in an unrealistic manner. Consideration must be given to deleting occurrences of abnormal noise from the measurements to obtain a reasonably accurate representation of the sound environment. Examples of abnormal noises include a dog barking close to the microphone, a vehicle passing nearby, people talking in the vicinity of the microphone in a quiet environment, or a passing road grader.

Airborne Sound

Sound that reaches the point of interest by propagation through air.

Ambient noise or sound

All noises that exist in an area and are not related to a facility under study. Ambient noise may include sound from other existing industrial facilities, transportation sources, animals, and nature. Context for ambient noise should be defined for each project.

Attenuation

The reduction of sound intensity by various means (e.g., air, humidity, porous materials, etc.)

A-weighted sound level

The sound level as measured on a sound level meter using a setting that emphasizes the middle frequency components similar to the frequency response of the human ear.

A-weighting shows that the measured sound pressure levels have been filtered using a frequency weighting network that mimics the response of the human ear.

The resultant sound pressure level with the associated unit "dBA" is therefore a representative of the subjective response of the human ear. The weightings are assigned in a way to reflect the higher sensitivity of human ear to sound in the mid and high frequency band as shown in the curve labelled A-weighting in Figure B-1.

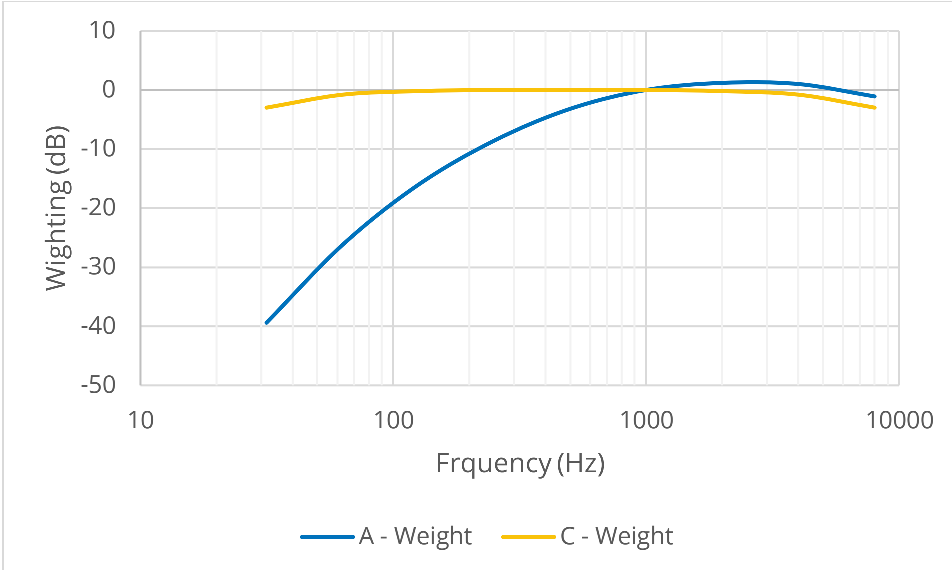


Figure B-1 Sound Weighting Network

Calibration

The procedure used for the adjustment of a sound level meter using a reference source of a known sound pressure level and frequency. Calibration must take place before and after the sound level measurements.

C-Weighted Sound Level

The sound level as measured on a sound level meter using a setting that emphasizes the low and middle frequency components. The weightings are assigned as shown in the curve labelled C-weighting in Figure B-1. The resultant sound pressure level is reported with the associated unit "dBC"

Daytime

Defined as the hours from 07:00 to 22:00.

dB (decibel)

A unit of measure of sound pressure that compresses a large range of numbers into a more meaningful scale. Hearing tests indicate that the lowest audible pressure is approximately 2 x 10-5 Pa (0 dB), while the sensation of pain is approximately 2 x 102 Pa (120 dB). Generally, an increase of 10 dB is perceived as twice as loud.

dBA

The decibel (dB) sound pressure level filtered through the A filtering network to approximate human hearing response at low frequencies.

dBC

The decibel (dB) sound pressure level filtered through the C filtering network to highlight low and middle frequencies.

Dwelling

Any permanently or seasonally occupied residence with the exception of an employee or worker residence, dormitory, or construction camp located within an industrial plant boundary. Trailer parks and campgrounds may qualify as a dwelling unit if it can be demonstrated that they are in regular and consistent use during the applicable season.

Energy equivalent sound level (Leq)

The Leq is the average A-weighted sound level over a specified period of time. It is a single-number representation of the cumulative acoustical energy measured over a time interval. If a sound level is constant over the measurement period, the Leq will equal the constant sound level where f is the fraction of time the constant level L is present.

Standardized Wind Speed at 10 m

The standardized wind speed at a height of 10 m is calculated in accordance with IEC 614000-11 (2012) and is given below. In the case of calculating the standardized wind speed for turbines in Alberta, a roughness length of 0.05 m is used, which is representative of farmland with vegetation.

$$V_H = V_{10}\left[\frac{\ln\left(\frac{H}{z_{0ref}}\right)}{\ln\left(\frac{10}{z_{0ref}}\right)}\right]$$

Where:

V_H is the wind speed at hub height z (m), determined from the power curve;

V_{10} is the standardized wind speed at 10m;

z_{0ref} is the reference roughness length of 0.05 m; and

H is the rotor centre height (m).

Far Field

Describes a region in free space where the sound pressure level from a source obeys the inverse-square law (the sound pressure level decreases 6 dB with each doubling of distance from the source). Also, in this region the sound particle velocity is in phase with the sound pressure. Closer to the source where these two conditions do not hold constitutes the “near field” region.

Frequency

The number of times per second that the sine wave of sound or of a vibrating object repeats itself. The unit is expressed in hertz (Hz), formerly in cycles per second (cps).

Human Perception of Sound

The human perception of noise impact is an important consideration in qualifying the noise effects caused by projects. The following table presents a general guideline.

Table B-1 Human Perception of Sound

Increase in Noise Level (dBA)	Perception
1 to 3	Imperceptible to possibly perceptible
4 to 5	just-noticeable difference
6 to 9	marginally significant
10 or more	significant, perceived as a doubling of sound level

Impulsive Noise

Single or multiple sound pressure peak(s) (with either a rise time less than 200 milliseconds or total duration less than 200 milliseconds) spaced at least by 500 millisecond pauses. A sharp sound pressure peak occurring in a short interval of time.

L_{EQ}

See Energy equivalent sound level.

Nighttime

Defined as the hours from 22:00 to 07:00.

Noise

Generally defined as the unwanted portion of sound.

Noise Level

This is the same as sound level except that it is applied to unwanted sounds, general the sound level at a point of reception.

Sound

A dynamic (fluctuating) pressure.

Sound level meter (SLM)

An instrument designed and calibrated to respond to sound and to give objective, reproducible measurements of sound pressure level. It normally has several features that would enable its frequency response and averaging times to be changed to make it suitable to simulate the response of the human ear.

Sound Pressure Level (SPL)

The logarithmic ratio of the RMS sound pressure to the sound pressure at the threshold of hearing. The sound pressure level is defined by equation (1) where P is the RMS pressure due to a sound and P0 is the reference pressure. P0 is usually taken as 2.0 × 10-5 Pascals.

$$\text{(1)} \quad SPL\ (dB) = 20 \log(PRMS/P0)$$

Sound Power Level (PWL)

The logarithmic ratio of the instantaneous sound power (energy) of a noise source to that of an international standard reference power. The sound power level is defined by equation (2) where W is the sound power of the source in watts, and W0 is the reference power of 10-12 watts.

$$\text{(2)} \quad PWL\ (dB) = 10 \log(W/W0)$$

Interrelationships between sound pressure level (SPL) and sound power level (PWL) depend on the location and type of source.

Spectrum

The description of a sound wave's resolution into its components of frequency and amplitude.

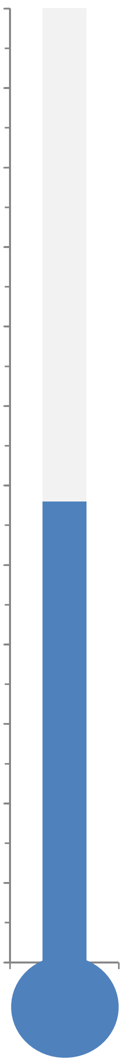
Speed of Sound in Air

344 m/s at 70°F (21°C) in air at sea level.

Tonal Components

Some industrial facilities typically exhibit a tonal component. Examples of tonal components are transformer hum, sirens, and piping noise. The test for the presence of tonal components consists of two parts. The first part must demonstrate that the sound pressure level of any one of the slow-response, A-weighted, 1/3-octave bands between 20 and 16000Hz is 10 dBA or more than the sound pressure level of at least one of the adjacent bands within two 1/3-octave bandwidths. In addition, there must be a minimum of a 5 dBA drop from the band containing the tone within 2 bandwidths on the opposite side. The second part is that the tonal component must be a pronounced peak clearly obvious within the spectrum.

RELATIONSHIPS BETWEEN EVERYDAY SOUNDS



	dBA	Sources of Noise
Deafening	120	- threshold of feeling / pain
	110	- accelerating motorcycle a few feet distance
		- loud auto horn 3 m (10 ft) away
Very Loud	100	- aance club / maximum human vocal output
		- jack hammer at 15 m (50 ft) distance
	90	- indoors in a noisy factory
		- heavy truck pass-by at 15 m (50 ft) distance
Loud	80	- noisy bar or school cafeteria
		- near the edge of a major highway / inside an automobile travelling at 60 km/h
	70	- noisy restaurant
		- normal human speech (unraised voice) at 1 m (3 ft) distance
	60	- typical background noise in large department store
Moderate	50	- inside average urban home/moderate rainfall/quiet street
	40	- typical sound in a library
Faint		- average background sound level in remote Alberta (Per AER/AUC)
	30	- bedroom of a country Home
		- average whisper
	20	- deep woods on a very calm day
Very Faint	10	
	0	- threshold of hearing

APPENDIX C

APPENDIX C: TURBINE LOCATIONS

Table C-1: Turbine Locations

Turbine Number	UTM Coordinates (NAD 83, Zone 13)		Turbine Number	UTM Coordinates (NAD 83, Zone 13)	
	Easting (m)	Northing (m)		Easting (m)	Northing (m)
1	478778	5452176.53	39	486052.18	5449202.62
2	477737	5452855.39	40	486905.09	5448665.3
3	477414	5452071.87	41	486105.65	5448289.7
4	478599	5452998.95	42	486106.59	5447669.16
6	478172	5451882.66	43	486791.43	5448143.9
8	478810	5450409.04	44	487637.59	5448509.03
9	478709	5449912.37	46	489078.49	5446930.51
11	478314	5449680.26	47	489099.48	5447512.35
12	477604	5449811.53	48	490043.8	5446877.64
13	476778	5449921.84	49	490587.15	5446912.84
14	476524	5449581.98	50	491014.09	5447097.58
16	479508	5450972.42	51	491658.48	5447107.2
17	479050	5450799.15	53	491415.67	5447885.77
20	481421	5449887	54	491584.64	5448386.51
22	481444	5448463.61	58	491556.06	5449866.03
29	482739	5448128.37	59	492183.59	5449696.94
30	482521	5447807.22	60	493443.43	5449534.23
37	486253	5449631.81	61	492913.46	5449507.59
38	486904	5449483.38			

Table C-2: Substation Locations

Substation Location	UTM Coordinates (NAD 83, Zone 13)	
	Easting (m)	Northing (m)
Substation Location 1	478756	5450145

APPENDIX D

Flexible Rating Specifications

The SG 6.0-170 is offered with various operational modes that are achieved through the flexible operating capacity of the product, enabling the configuration of an optimal power rating that is best suited for each wind farm. The operating modes are broadly divided into two categories: Application Modes and Noise Reduction System Modes[4].

Application Modes

Application Modes ensure optimal turbine performance with maximum power rating allowed by the structural and electrical systems of the turbine. There are multiple Application Modes, offering flexibility of different power ratings. All Application Modes are part of the turbine Certificate.

SG 6.0-170 can offer increased operation flexibility with modes based on AM 0 with reduced power rating. These new modes are created with same noise performance of the corresponding Application Mode 0 but with decreased rating and improved temperature de-rating than the corresponding Application Mode 0. In addition, the turbine's electrical performance is constant for the full set of application modes, as shown on the table below.

The SG 6.0-170 is designed with a base wind class, applicable to AM 0, of IEC IIIA for 20 year lifetime as well as IEC IIIB for 25 year lifetime. All other Application Modes may be analysed for more demanding site conditions.

Full List of Application Modes

Rotor Configuration	Application mode	Rating [MW]	Noise [dB(A)]	Power Curve Document	Acoustic Emission Document	Electrical Performance			Max temperature With Max active power and electrical capabilities[5]
						Cos Phi	Voltage Range	Frequency range	
SG 6.0-170	AM 0	6.2	106	D2075729	D2359593	0.9	[0.95,1.12] Un	±3% Fn	30ºC
SG 6.0-170	AM-1	6.1	106	D2356499	D2359593	0.9	[0.95,1.12] Un	±3% Fn	33ºC
SG 6.0-170	AM-2	6.0	106	D2356509	D2359593	0.9	[0.95,1.12] Un	±3% Fn	35ºC
SG 6.0-170	AM-3	5.9	106	D2356523	D2359593	0.9	[0.95,1.12] Un	±3% Fn	37ºC
SG 6.0-170	AM-4	5.8	106	D2356539	D2359593	0.9	[0.95,1.12] Un	±3% Fn	38ºC
SG 6.0-170	AM-5	5.7	106	D2356376	D2359593	0.9	[0.95,1.12] Un	±3% Fn	39ºC
SG 6.0-170	AM-6	5.6	106	D2356368	D2359593	0.9	[0.95,1.12] Un	±3% Fn	40ºC

4 It should be noted that the definition of various modes as described in this chapter is applicable in combination with standard temperature limits and grid capabilities of the turbine. Please refer to High Temperature Power De-rating Specification and Reactive Power Capability Document for more information
5 Please Refer to "High Temperature Power De-rating Specification" for more details'

Standard Acoustic Emission, Rev. 0, AM 0 - AM-6, N1 - N7

SG 6.0-170

Standard Acoustic Emission, Rev. 0, AM 0 - AM-6, N1 - N7

Typical Sound Power Levels

The sound power levels are presented with reference to the code IEC 61400-11 ed. 3.0 (2012). The sound power levels (L_{WA}) presented are valid for the corresponding wind speeds referenced to the hub height.

Wind speed [m/s]	3	4	5	6	7	8	9	10	11	12	Up tp cut-out
AM 0	92.0	92.0	94.5	98.4	101.8	104.7	106.0	106.0	106.0	106.0	106.0
AM-1	92.0	92.0	94.5	98.4	101.8	104.7	106.0	106.0	106.0	106.0	106.0
AM-2	92.0	92.0	94.5	98.4	101.8	104.7	106.0	106.0	106.0	106.0	106.0
AM-3	92.0	92.0	94.5	98.4	101.8	104.7	106.0	106.0	106.0	106.0	106.0
AM-4	92.0	92.0	94.5	98.4	101.8	104.7	106.0	106.0	106.0	106.0	106.0
AM-5	92.0	92.0	94.5	98.4	101.8	104.7	106.0	106.0	106.0	106.0	106.0
AM-6	92.0	92.0	94.5	98.4	101.8	104.7	106.0	106.0	106.0	106.0	106.0
N1	92.0	92.0	94.5	98.4	101.8	105.5	105.5	105.5	105.5	105.5	105.5
N2	92.0	92.0	94.5	98.4	101.8	104.5	104.5	104.5	104.5	104.5	104.5
N3	92.0	92.0	94.5	98.4	101.8	103.0	103.0	103.0	103.0	103.0	103.0
N4	92.0	92.0	94.5	98.4	101.8	102.0	102.0	102.0	102.0	102.0	102.0
N5	92.0	92.0	94.5	98.4	101.0	101.0	101.0	101.0	101.0	101.0	101.0
N6	92.0	92.0	94.5	98.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0
N7	92.0	92.0	94.5	98.4	99.0	99.0	99.0	99.0	99.0	99.0	99.0

Table 1: Acoustic emission, L_{WA}[dB(A) re 1 pW](10 Hz to 10kHz)]

Wind speed [m/s]	6	8
AM 0	87.6	93.9
AM-1	87.6	93.9
AM-2	87.6	93.9
AM-3	87.6	93.9
AM-4	87.6	93.9
AM-5	87.6	93.9
AM-6	87.6	93.9
N1	87.6	93.9
N2	87.6	93.9
N3	87.6	92.7
N4	87.6	91.9
N5	87.6	91.0
N6	87.6	90.2
N7	87.6	89.3

Table 2: Acoustic emission, L_{WA}[dB(A) re 1 pW](10 Hz to 160 Hz)]

Low Noise Operations

The lower sound power level is also available and can be achieved by adjusting the turbines controller settings, i.e. an optimization of rpm and pitch. The noise settings are not static and can be applied to optimize the operational output of the turbine. Noise settings can be tailored to time of day as well as wind direction to offer the most suitable solution for a specific location. This functionality is controlled via the SCADA system and is described further in the white paper on Noise Reduction Operations. Furthermore, tailored power curves can be provided which take wind speed into consideration allowing for management of the turbine output power and noise emission level to comply with site specific noise requirements.Tailored power curves are project and turbine specific and will therefore require Siemens Gamesa Siting involvement to provide the optimal solutions. The lower sound power levels may not be applicable to all tower variants. Please contact Siemens Gamesa for further information.

Typical Sound Power Frequency Distribution
Typical spectra for L_{WA} in dB(A) re 1 pW for the corresponding centre frequencies are tabulated below for 6 and 8 m/s referenced to hub height.

1/1 oct. band center freq.	63	125	250	500	1000	2000	4000	8000
AM 0	79.9	86.7	88.9	89.9	93.1	92.8	88.3	76.5
AM-1	79.9	86.7	88.9	89.9	93.1	92.8	88.3	76.5
AM-2	79.9	86.7	88.9	89.9	93.1	92.8	88.3	76.5
AM-3	79.9	86.7	88.9	89.9	93.1	92.8	88.3	76.5
AM-4	79.9	86.7	88.9	89.9	93.1	92.8	88.3	76.5
AM-5	79.9	86.7	88.9	89.9	93.1	92.8	88.3	76.5
AM-6	79.9	86.7	88.9	89.9	93.1	92.8	88.3	76.5
N1	79.9	86.7	88.9	89.9	93.1	92.8	88.3	76.5
N2	79.9	86.7	88.9	89.9	93.1	92.8	88.3	76.5
N3	79.9	86.7	88.9	89.9	93.1	92.8	88.3	76.5
N4	79.9	86.7	88.9	89.9	93.1	92.8	88.3	76.5
N5	79.9	86.7	88.9	89.9	93.1	92.8	88.3	76.5
N6	79.9	86.7	88.9	89.9	93.1	92.8	88.3	76.5
N7	79.9	86.7	88.9	89.9	93.1	92.8	88.3	76.5

Table 3: Typical 1/1 octave band spectrum for 63 Hz to 8 kHz at 6 m/s

1/1 oct. band center freq.	63	125	250	500	1000	2000	4000	8000
AM 0	86.2	93.0	95.2	96.2	99.4	99.1	94.6	82.8
AM-1	86.2	93.0	95.2	96.2	99.4	99.1	94.6	82.8
AM-2	86.2	93.0	95.2	96.2	99.4	99.1	94.6	82.8
AM-3	86.2	93.0	95.2	96.2	99.4	99.1	94.6	82.8
AM-4	86.2	93.0	95.2	96.2	99.4	99.1	94.6	82.8
AM-5	86.2	93.0	95.2	96.2	99.4	99.1	94.6	82.8
AM-6	86.2	93.0	95.2	96.2	99.4	99.1	94.6	82.8
N1	86.2	93.0	95.2	96.2	99.4	99.1	94.6	82.8
N2	85.4	93.2	95.6	95.1	98.5	99.3	94.5	83.3
N3	84.6	91.9	94.1	93.6	97.0	97.8	93.0	81.8
N4	84.1	91.0	93.1	92.6	96.0	96.8	92.0	80.8
N5	83.5	90.1	92.1	91.6	95.0	95.8	91.0	79.8
N6	83.0	89.2	91.1	90.6	94.0	94.8	90.0	78.8
N7	82.4	88.2	90.1	89.6	93.0	93.8	89.0	77.8

Table 4: Typical 1/1 octave band spectrum for 63 Hz to 8 kHz at 8 m/s

1/3 oct. band center freq.	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
AM 0	43.3	46.3	49.6	52.7	55.7	60.9	63.9	70.1	74.3	77.8	80.1	82.0	83.2
AM-1	43.3	46.3	49.6	52.7	55.7	60.9	63.9	70.1	74.3	77.8	80.1	82.0	83.2
AM-2	43.3	46.3	49.6	52.7	55.7	60.9	63.9	70.1	74.3	77.8	80.1	82.0	83.2
AM-3	43.3	46.3	49.6	52.7	55.7	60.9	63.9	70.1	74.3	77.8	80.1	82.0	83.2
AM-4	43.3	46.3	49.6	52.7	55.7	60.9	63.9	70.1	74.3	77.8	80.1	82.0	83.2
AM-5	43.3	46.3	49.6	52.7	55.7	60.9	63.9	70.1	74.3	77.8	80.1	82.0	83.2
AM-6	43.3	46.3	49.6	52.7	55.7	60.9	63.9	70.1	74.3	77.8	80.1	82.0	83.2
N1	43.3	46.3	49.6	52.7	55.7	60.9	63.9	70.1	74.3	77.8	80.1	82.0	83.2
N2	43.3	46.3	49.6	52.7	55.7	60.9	63.9	70.1	74.3	77.8	80.1	82.0	83.2
N3	43.3	46.3	49.6	52.7	55.7	60.9	63.9	70.1	74.3	77.8	80.1	82.0	83.2
N4	43.3	46.3	49.6	52.7	55.7	60.9	63.9	70.1	74.3	77.8	80.1	82.0	83.2
N5	43.3	46.3	49.6	52.7	55.7	60.9	63.9	70.1	74.3	77.8	80.1	82.0	83.2
N6	43.3	46.3	49.6	52.7	55.7	60.9	63.9	70.1	74.3	77.8	80.1	82.0	83.2
N7	43.3	46.3	49.6	52.7	55.7	60.9	63.9	70.1	74.3	77.8	80.1	82.0	83.2

Table 5: Typical 1/3 octave band spectrum for 10 Hz to 160 Hz at 6 m/s

1/3 oct. band center freq.	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
AM 0	49.6	52.6	55.9	59.0	62.0	67.2	70.2	76.4	80.6	84.1	86.4	88.3	89.5
AM-1	49.6	52.6	55.9	59.0	62.0	67.2	70.2	76.4	80.6	84.1	86.4	88.3	89.5
AM-2	49.6	52.6	55.9	59.0	62.0	67.2	70.2	76.4	80.6	84.1	86.4	88.3	89.5
AM-3	49.6	52.6	55.9	59.0	62.0	67.2	70.2	76.4	80.6	84.1	86.4	88.3	89.5
AM-4	49.6	52.6	55.9	59.0	62.0	67.2	70.2	76.4	80.6	84.1	86.4	88.3	89.5
AM-5	49.6	52.6	55.9	59.0	62.0	67.2	70.2	76.4	80.6	84.1	86.4	88.3	89.5
AM-6	49.6	52.6	55.9	59.0	62.0	67.2	70.2	76.4	80.6	84.1	86.4	88.3	89.5
N1	49.6	52.6	55.9	59.0	62.0	67.2	70.2	76.4	80.6	84.1	86.4	88.3	89.5
N2	50.6	53.6	56.9	60.0	63.0	66.6	71.4	75.7	79.5	83.4	87.2	88.1	89.7
N3	50.6	53.6	56.9	59.9	62.8	66.3	71.1	75.2	78.8	82.5	86.1	86.8	88.2
N4	50.6	53.6	56.8	59.8	62.7	66.1	70.8	74.9	78.4	81.9	85.4	86.0	87.1
N5	50.6	53.6	56.8	59.8	62.6	65.9	70.5	74.5	77.9	81.3	84.6	85.1	86.1
N6	50.6	53.6	56.8	59.7	62.5	65.7	70.3	74.1	77.4	80.7	83.9	84.2	85.0
N7	50.6	53.6	56.7	59.6	62.3	65.6	70.0	73.8	76.9	80.1	83.1	83.3	83.9

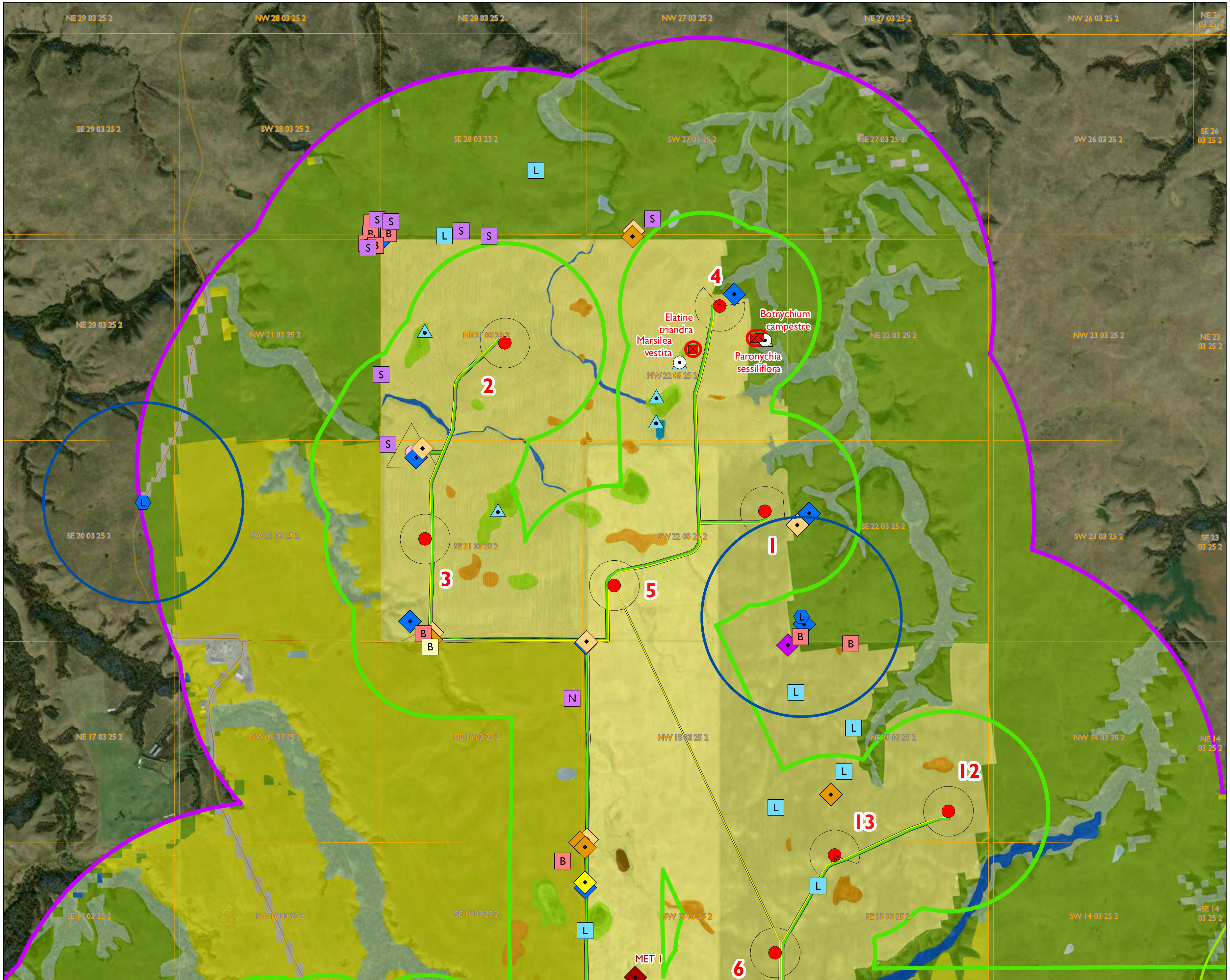
Table 6: Typical 1/3 octave band spectrum for 10 Hz to 160 Hz at 8 m/s

For a detailed description of all modes, please refer to Flexible Rating Specification (D2316244).

Appendix G

Biophysical Map Set

Outlaw Trail Wind LP
Outlaw Trail Wind Energy Project
February 2021 - 19-1825



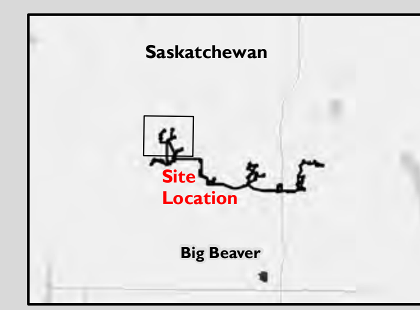
OUTLAW TRAIL WIND LP
OUTLAW TRAIL WIND ENERGY PROJECT

BluEarth RENEWABLES FHQ Developments

FIGURE G - 1
BIOPHYSICAL MAPSET
(PAGE 1 OF 8)

Proposed Project Layout
- Wind Turbine Generator
- Meteorological Towers
- Collector Line - Underground Feeder
- Collector Line - Overhead
- New Access Road
- Substation

Spatial Boundaries
- Project Development Area
- Vegetation and Wetlands Local Assessment Area
- Wildlife and Wildlife Habitat Local Assessment Area
- Quarter Sections
- Minor Roads
- Major Roads



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0 200 400 800 Meters

MAP DRAWING INFORMATION:
DATA PROVIDED BY CANVEC, ESRI, GEOSASK, STANTEC & DILLON CONSULTING
MAP CREATED BY PH
MAP CHECKED BY CD
MAP PROJECTION: NAD 1983 UTM Zone 13N ROTATION: -0.25°

DILLON CONSULTING

PROJECT: 191825
STATUS: FINAL
DATE: 2021-03-01

Species of Management Concern Observations

- Rare Plant
- Noxious Weed
- Ferruginous Hawk Nest
- Sharp-tailed Grouse Lek
- Sharp-tailed Grouse Lek (Potential)
- A American Badger
- B Baird's Sparrow
- B Barn Swallow
- B Bobolink
- C Chestnut-collared Longspur
- N Common Nighthawk
- F Ferruginous Hawk
- L Lark Bunting
- L Long-billed Curlew
- F Northern Leopard Frog
- O Osprey
- R Red-necked Phalarope
- S Short-eared Owl
- S Sprague's Pipit

Species of Management Concern Setbacks

- Rare Plant Setback (30 m)
- Ferruginous Hawk Nest Setback (1000 m, year round)
- Northern Leopard Frog Breeding Pond Setback (500 m, year round)
- Sharp-tailed Grouse Lek Setback (400 m, March 15 to May 15)

Biophysical Surveys

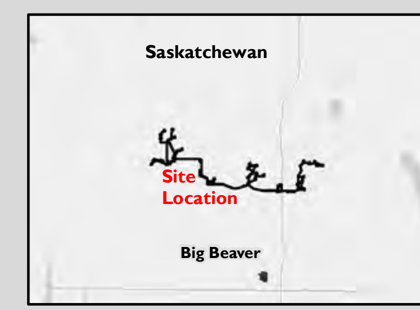
- Vegetation Community Survey Site
- Wetland Survey Site
- Amphibian Survey Site
- Bat Monitoring Station
- Bird Movement Survey Site
- Breeding Bird Survey Site
- Burrowing Owl Survey Site
- Common Nighthawk/Short-eared Owl Survey Site
- Sharp-tailed Grouse Lek Survey Site
- Yellow Rail Survey Site

Land Cover

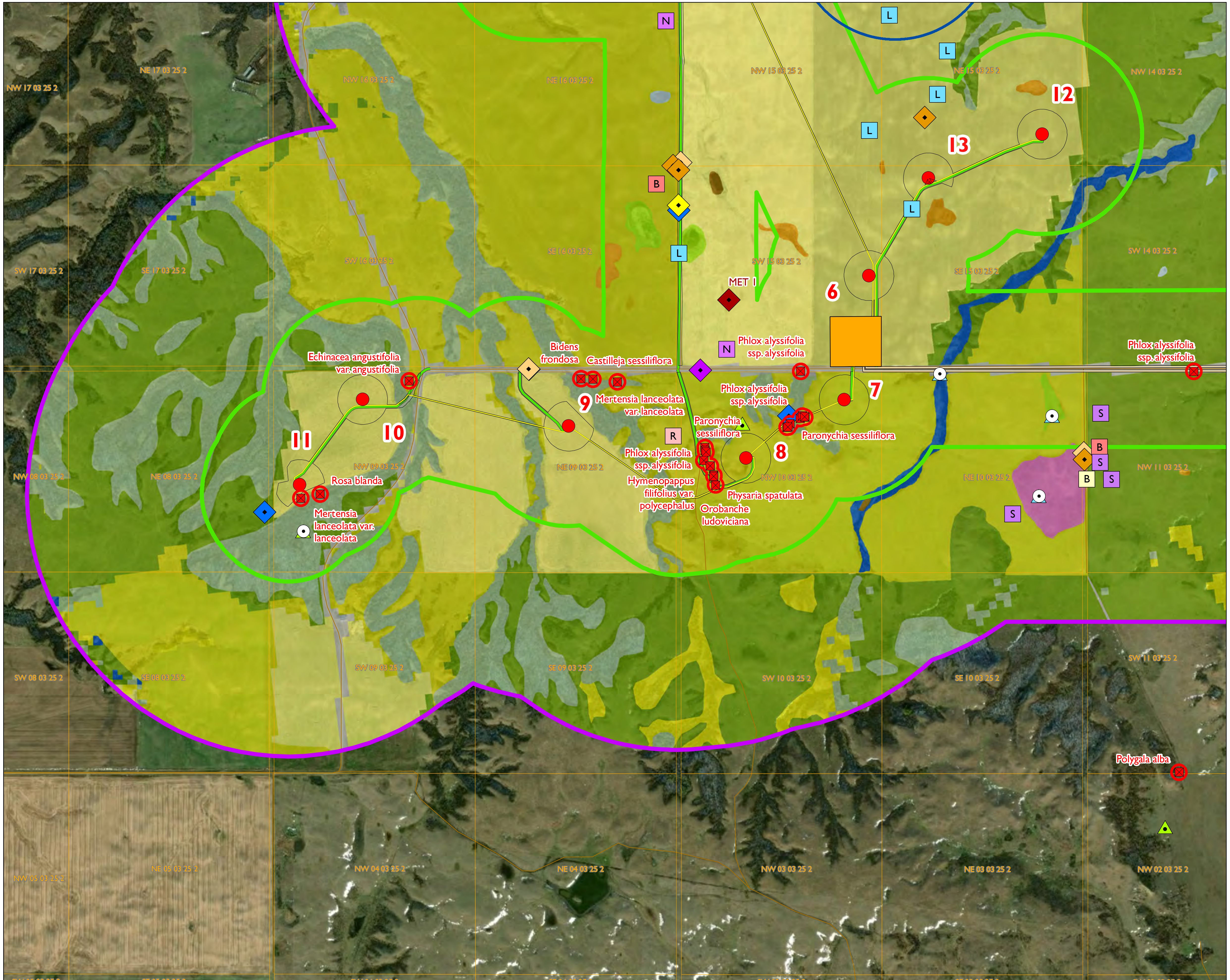
- Class 1 - Ephermeral Wetland
- Class 2 - Temporary Wetland
- Class 3 - Seasonal Wetland
- Class 4 - Semi-Permanent Wetland
- Class 5 - Permanent Wetland
- Drainage
- Dugout
- Agricultural
- Broadleaf
- Exposed Land / Barren
- Native Grassland
- Pasture / Forages
- Shrubland
- Urban / Developed
- Water

OUTLAW TRAIL WIND LP
OUTLAW TRAIL WIND ENERGY PROJECT

INDEX
BIOPHYSICAL MAPSET



PROJECT: 191825
STATUS: FINAL

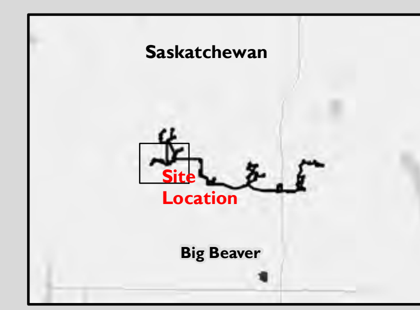


OUTLAW TRAIL WIND LP
OUTLAW TRAIL WIND ENERGY PROJECT

FIGURE G - 2
BIOPHYSICAL MAPSET
(PAGE 2 OF 8)

Proposed Project Layout
- Wind Turbine Generator
- Meteorological Towers
- Collector Line - Underground Feeder
- Collector Line - Overhead
- New Access Road
- Substation

Spatial Boundaries
- Project Development Area
- Vegetation and Wetlands Local Assessment Area
- Wildlife and Wildlife Habitat Local Assessment Area
- Quarter Sections
- Minor Roads
- Major Roads



1:15,000
0 200 400 800 Meters

MAP DRAWING INFORMATION:
DATA PROVIDED BY CANVEC, ESRI, GEOSASK, STANTEC & DILLON CONSULTING

MAP CREATED BY PH
MAP CHECKED BY CD

MAP PROJECTION: NAD 1983 UTM Zone 13N ROTATION: -0.25°

DILLON CONSULTING

PROJECT: 191825
STATUS: FINAL
DATE: 2021-03-01

FILE LOCATION: G:\GIS\2019\191825 - Outlaw Trail Energy Project\Product\Client\EIS\Figure G_2 Biophysical Mapset.mxd

Species of Management Concern Observations

- Rare Plant
- Noxious Weed
- Ferruginous Hawk Nest
- Sharp-tailed Grouse Lek
- Sharp-tailed Grouse Lek (Potential)
- American Badger
- Baird's Sparrow
- Barn Swallow
- Bobolink
- Chestnut-collared Longspur
- Common Nighthawk
- Ferruginous Hawk
- Lark Bunting
- Long-billed Curlew
- Northern Leopard Frog
- Osprey
- Red-necked Phalarope
- Short-eared Owl
- Sprague's Pipit

Species of Management Concern Setbacks

- Rare Plant Setback (30 m)
- Ferruginous Hawk Nest Setback (1000 m, year round)
- Northern Leopard Frog Breeding Pond Setback (500 m, year round)
- Sharp-tailed Grouse Lek Setback (400 m, March 15 to May 15)

Biophysical Surveys

- Vegetation Community Survey Site
- Wetland Survey Site
- Amphibian Survey Site
- Bat Monitoring Station
- Bird Movement Survey Site
- Breeding Bird Survey Site
- Burrowing Owl Survey Site
- Common Nighthawk/Short-eared Owl Survey Site
- Sharp-tailed Grouse Lek Survey Site
- Yellow Rail Survey Site

Land Cover

- Class 1 - Ephermeral Wetland
- Class 2 - Temporary Wetland
- Class 3 - Seasonal Wetland
- Class 4 - Semi-Permanent Wetland
- Class 5 - Permanent Wetland
- Drainage
- Dugout
- Agricultural
- Broadleaf
- Exposed Land / Barren
- Native Grassland
- Pasture / Forages
- Shrubland
- Urban / Developed
- Water

OUTLAW TRAIL WIND LP
OUTLAW TRAIL WIND ENERGY PROJECT

BluEarth RENEWABLES

FHQ

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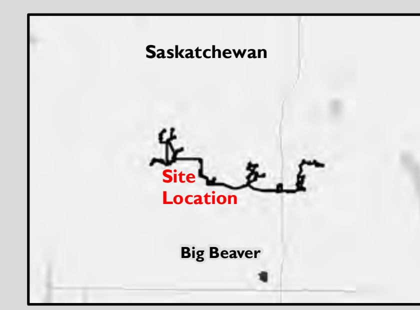

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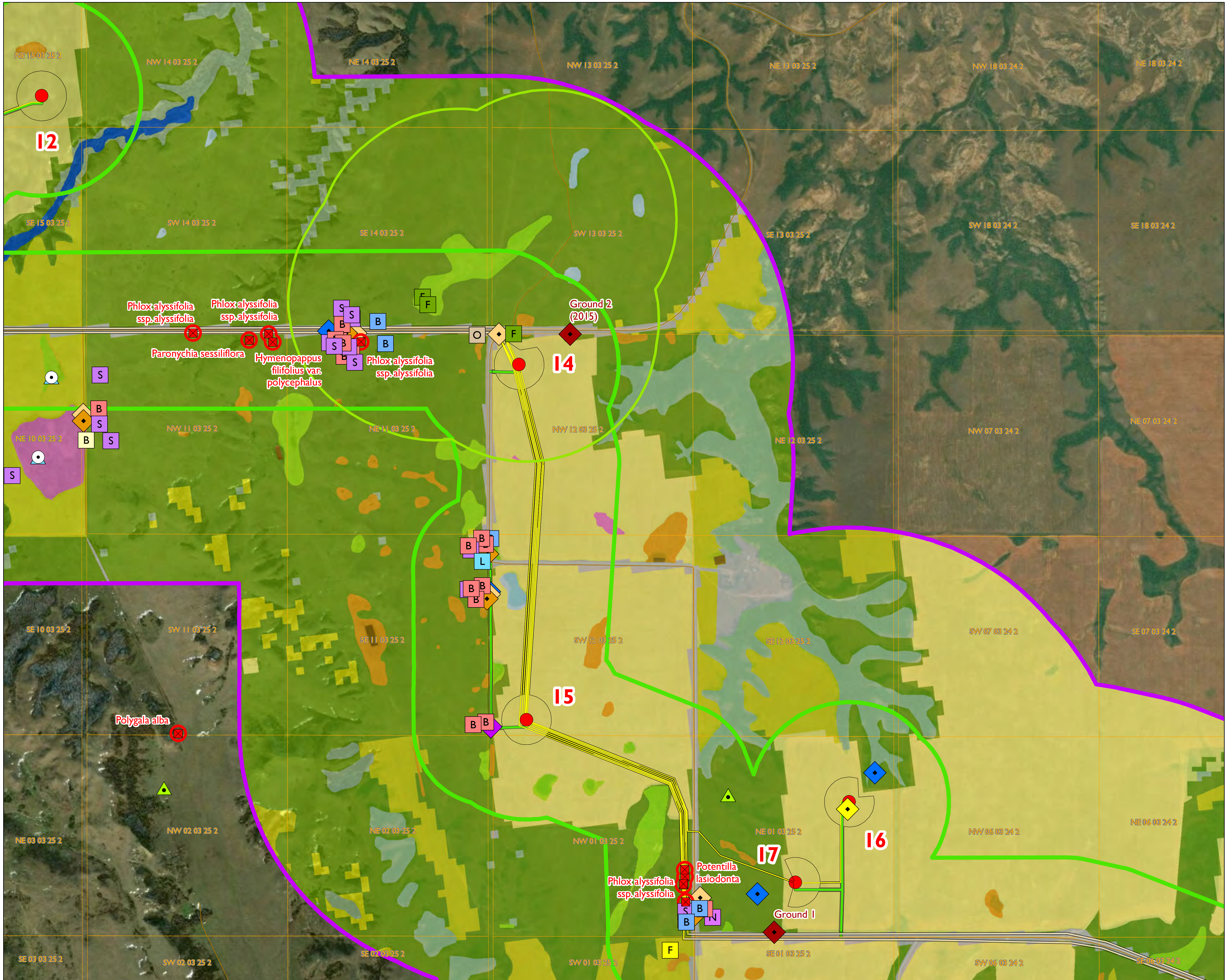

OUTLAW TRAIL WIND LP
OUTLAW TRAIL WIND ENERGY PROJECT

FIGURE G - 3
BIOPHYSICAL MAPSET
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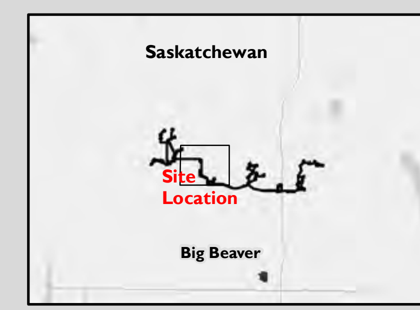
Proposed Project Layout
- Wind Turbine Generator
- Meteorological Towers
- Collector Line - Underground Feeder
- Collector Line - Overhead
- New Access Road
- Substation

Spatial Boundaries
- Project Development Area
- Vegetation and Wetlands Local Assessment Area
- Wildlife and Wildlife Habitat Local Assessment Area
- Quarter Sections
- Minor Roads
- Major Roads



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Species of Management Concern Observations

- Rare Plant
- Noxious Weed
- Ferruginous Hawk Nest
- Sharp-tailed Grouse Lek
- Sharp-tailed Grouse Lek (Potential)
- A American Badger
- B Baird's Sparrow
- B Barn Swallow
- B Bobolink
- C Chestnut-collared Longspur
- N Common Nighthawk
- F Ferruginous Hawk
- L Lark Bunting
- L Long-billed Curlew
- F Northern Leopard Frog
- O Osprey
- R Red-necked Phalarope
- S Short-eared Owl
- S Sprague's Pipit

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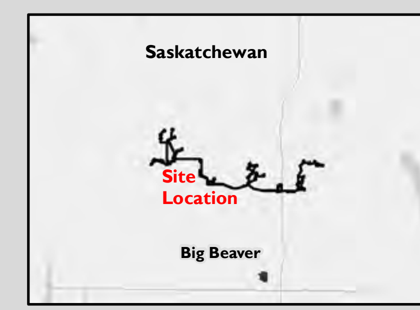

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OUTLAW TRAIL WIND LP
OUTLAW TRAIL WIND ENERGY PROJECT

BluEarth RENEWABLES — FHQ Developments

FIGURE G - 4
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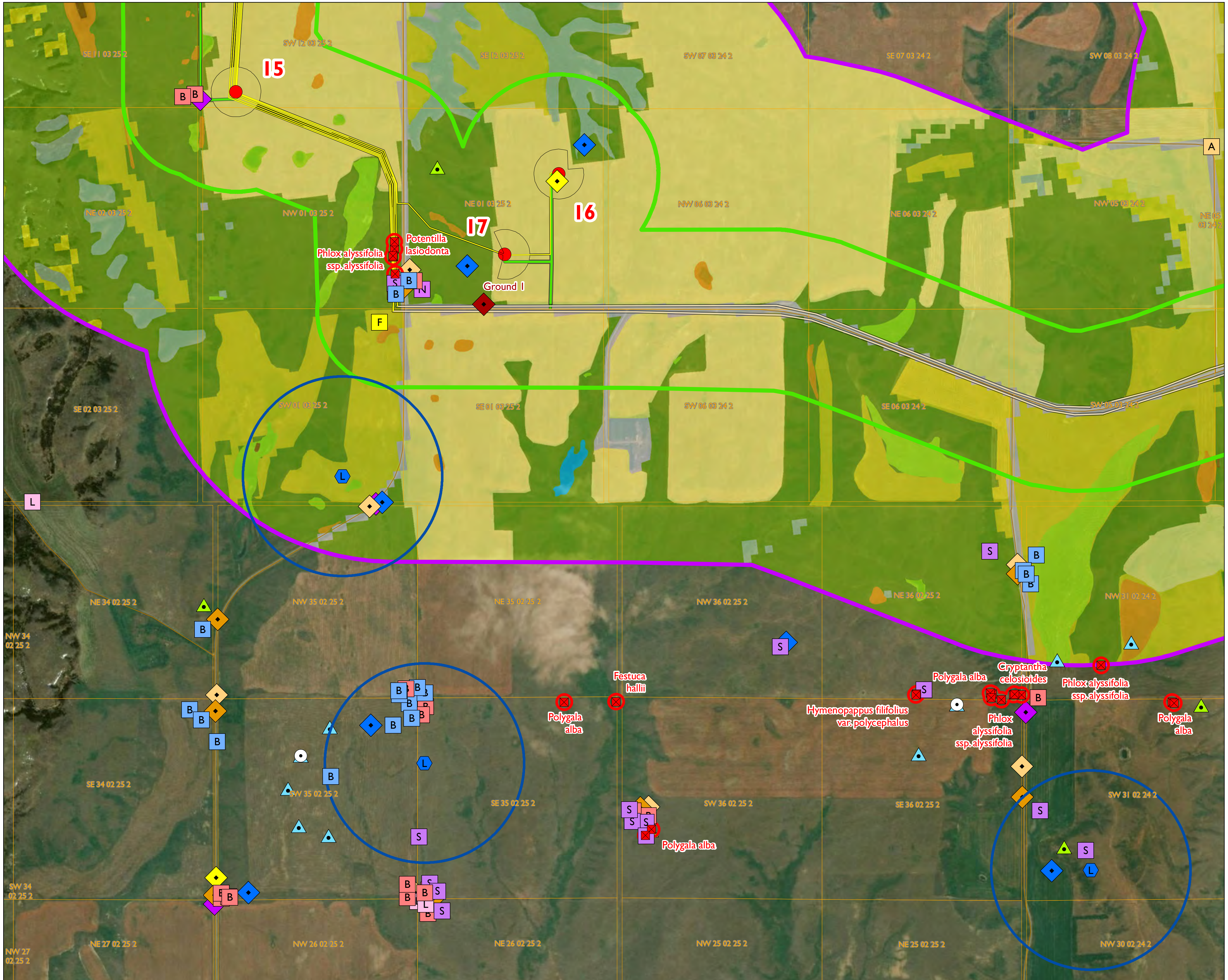

Proposed Project Layout

- Wind Turbine Generator
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- Collector Line - Overhead
- New Access Road
- Substation

Spatial Boundaries

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- Wildlife and Wildlife Habitat Local Assessment Area
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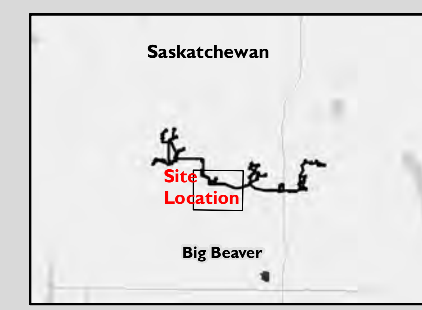
- Minor Roads
- Major Roads



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Species of Management Concern Observations

- Rare Plant
- Noxious Weed
- Ferruginous Hawk Nest
- Sharp-tailed Grouse Lek
- Sharp-tailed Grouse Lek (Potential)
- A American Badger
- B Baird's Sparrow
- B Barn Swallow
- B Bobolink
- C Chestnut-collared Longspur
- N Common Nighthawk
- F Ferruginous Hawk
- L Lark Bunting
- L Long-billed Curlew
- F Northern Leopard Frog
- O Osprey
- R Red-necked Phalarope
- S Short-eared Owl
- S Sprague's Pipit

Species of Management Concern Setbacks

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- Pasture / Forages
- Shrubland
- Urban / Developed
- Water

OUTLAW TRAIL WIND LP
OUTLAW TRAIL WIND ENERGY PROJECT

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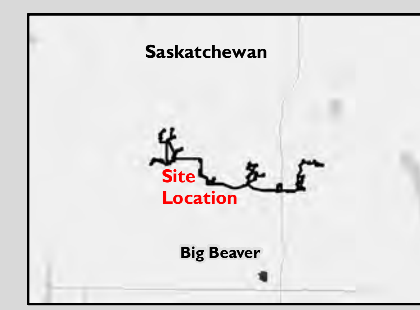

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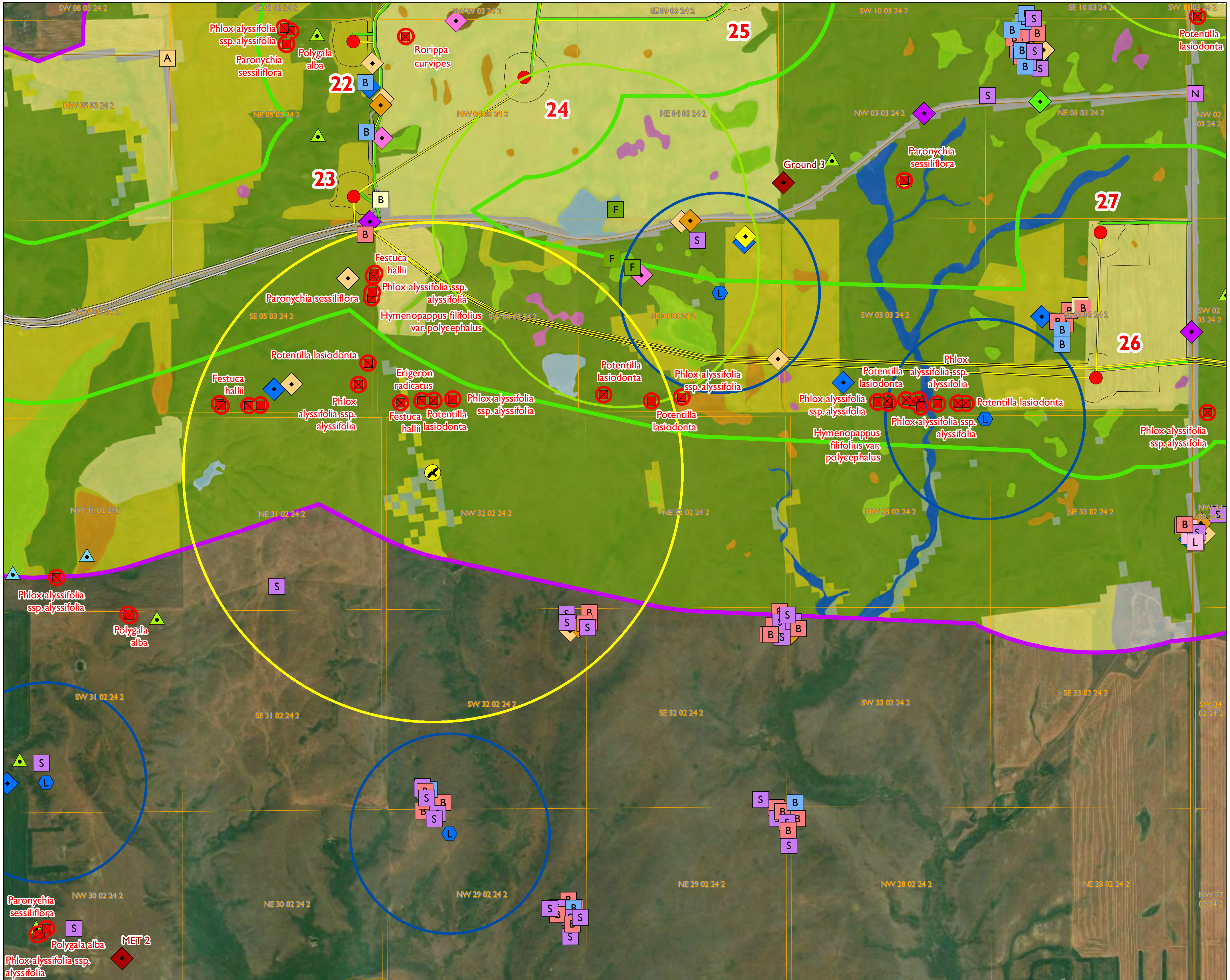

OUTLAW TRAIL WIND LP

OUTLAW TRAIL WIND ENERGY PROJECT

FIGURE G - 5
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Proposed Project Layout

- Wind Turbine Generator
- Meteorological Towers
- Collector Line - Underground Feeder
- Collector Line - Overhead
- New Access Road
- Substation

Spatial Boundaries

- Project Development Area
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- Wildlife and Wildlife Habitat Local Assessment Area
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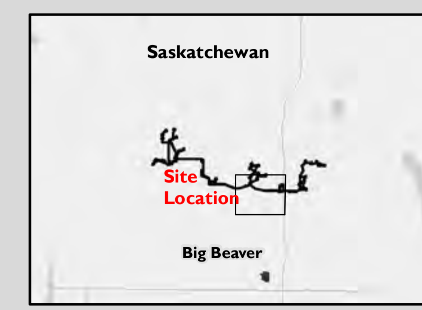
- Minor Roads
- Major Roads



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Species of Management Concern Observations

- Rare Plant
- Noxious Weed
- Ferruginous Hawk Nest
- Sharp-tailed Grouse Lek
- Sharp-tailed Grouse Lek (Potential)
- American Badger
- Baird's Sparrow
- Barn Swallow
- Bobolink
- Chestnut-collared Longspur
- Common Nighthawk
- Ferruginous Hawk
- Lark Bunting
- Long-billed Curlew
- Northern Leopard Frog
- Osprey
- Red-necked Phalarope
- Short-eared Owl
- Sprague's Pipit

Species of Management Concern Setbacks

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- Common Nighthawk/Short-eared Owl Survey Site
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Land Cover

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- Pasture / Forages
- Shrubland
- Urban / Developed
- Water

OUTLAW TRAIL WIND LP
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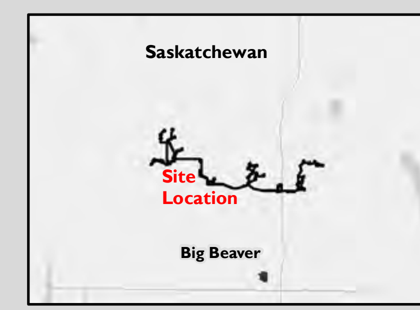

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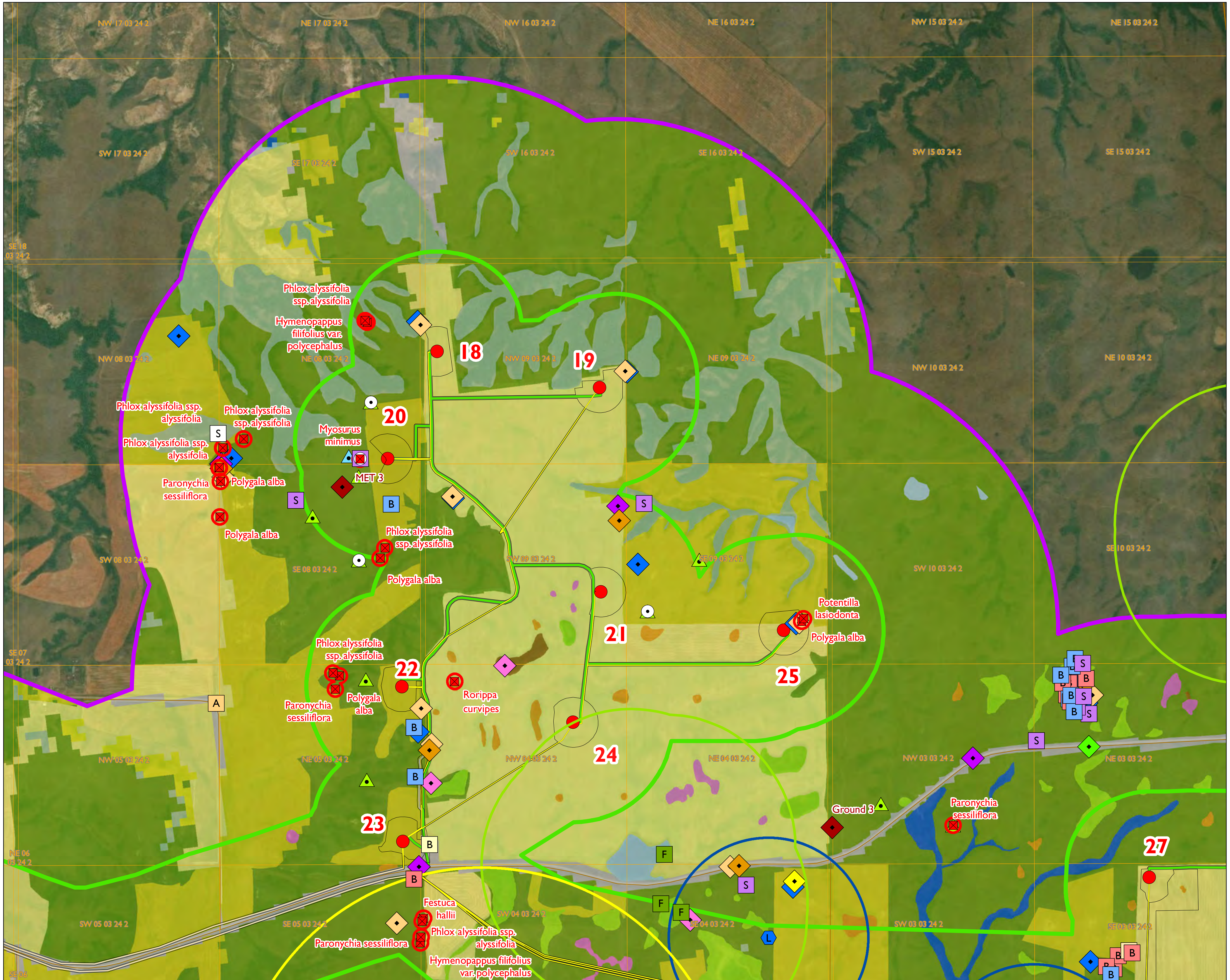

OUTLAW TRAIL WIND LP
OUTLAW TRAIL WIND ENERGY PROJECT

BluEarth RENEWABLES

FHQ Developments

FIGURE G - 6
BIOPHYSICAL MAPSET
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Proposed Project Layout
- Wind Turbine Generator
- Meteorological Towers
- Collector Line - Underground Feeder
- Collector Line - Overhead
- New Access Road
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Spatial Boundaries
- Project Development Area
- Vegetation and Wetlands Local Assessment Area
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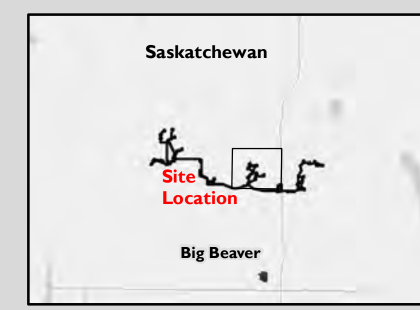
- Quarter Sections
- Minor Roads
- Major Roads



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Species of Management Concern Observations

- Rare Plant
- Noxious Weed
- Ferruginous Hawk Nest
- Sharp-tailed Grouse Lek
- Sharp-tailed Grouse Lek (Potential)
- A American Badger
- B Baird's Sparrow
- B Barn Swallow
- B Bobolink
- C Chestnut-collared Longspur
- N Common Nighthawk
- F Ferruginous Hawk
- L Lark Bunting
- L Long-billed Curlew
- F Northern Leopard Frog
- O Osprey
- R Red-necked Phalarope
- S Short-eared Owl
- S Sprague's Pipit

Species of Management Concern Setbacks

- Rare Plant Setback (30 m)
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- Sharp-tailed Grouse Lek Survey Site
- Yellow Rail Survey Site

Land Cover

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- Pasture / Forages
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- Urban / Developed
- Water

OUTLAW TRAIL WIND LP
OUTLAW TRAIL WIND ENERGY PROJECT

BluEarth RENEWABLES FHQ

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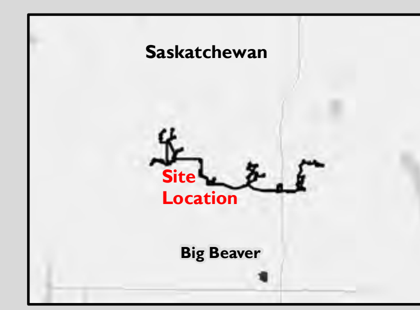

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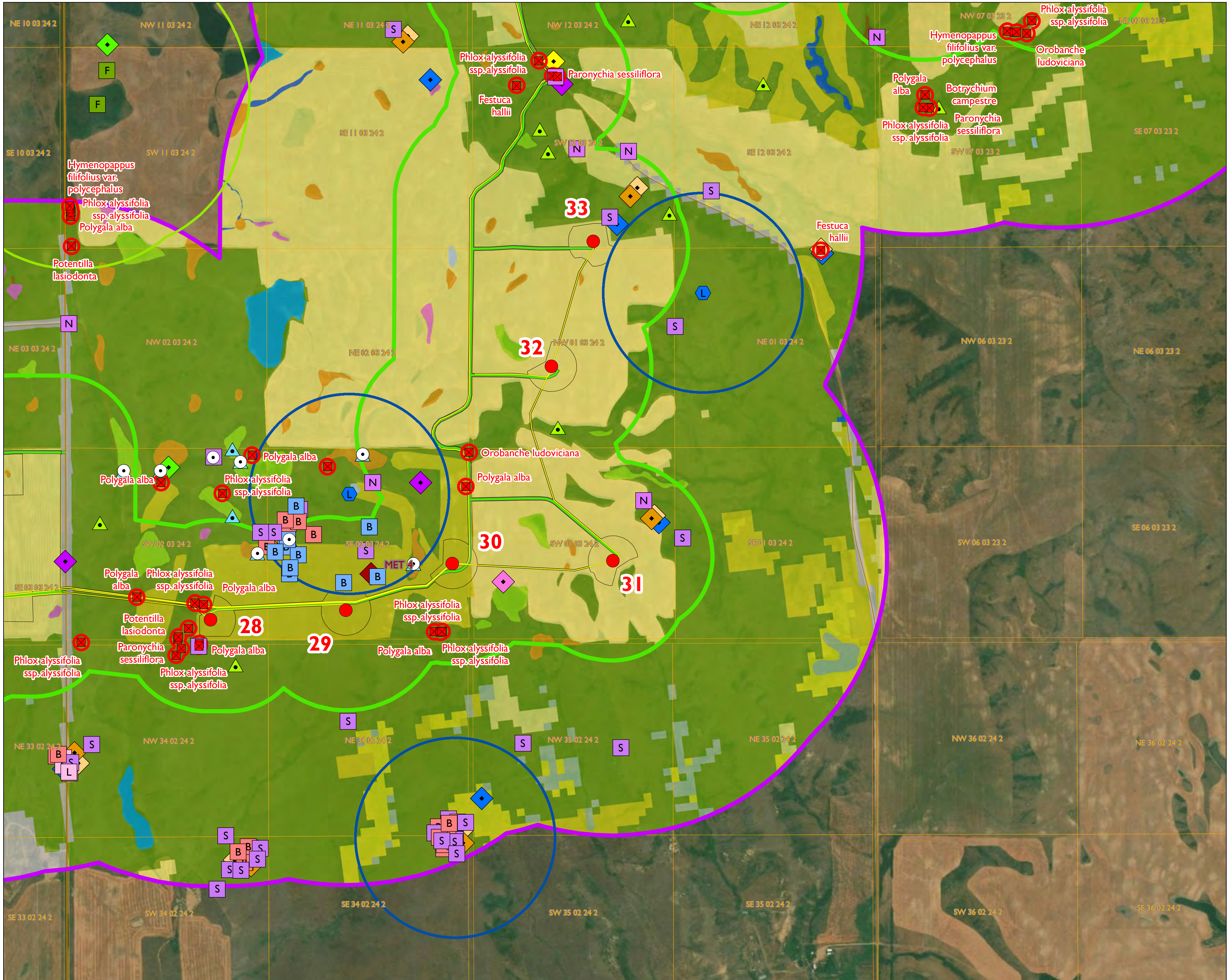

OUTLAW TRAIL WIND LP

OUTLAW TRAIL WIND ENERGY PROJECT

FIGURE G - 7
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Proposed Project Layout

- Wind Turbine Generator
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- Collector Line - Underground Feeder
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- New Access Road
- Substation

Spatial Boundaries

- Project Development Area
- Vegetation and Wetlands Local Assessment Area
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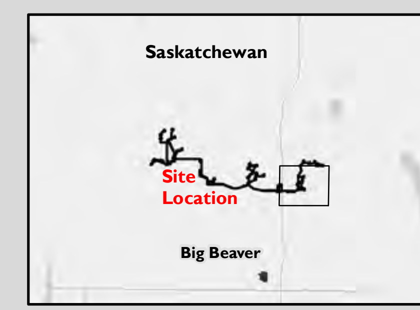

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Species of Management Concern Observations
- Rare Plant
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OUTLAW TRAIL WIND LP
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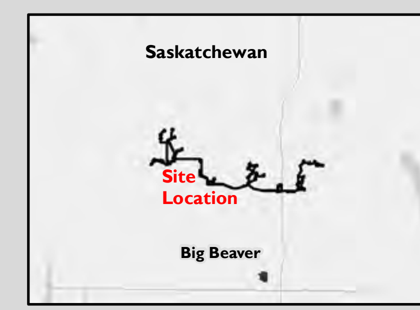

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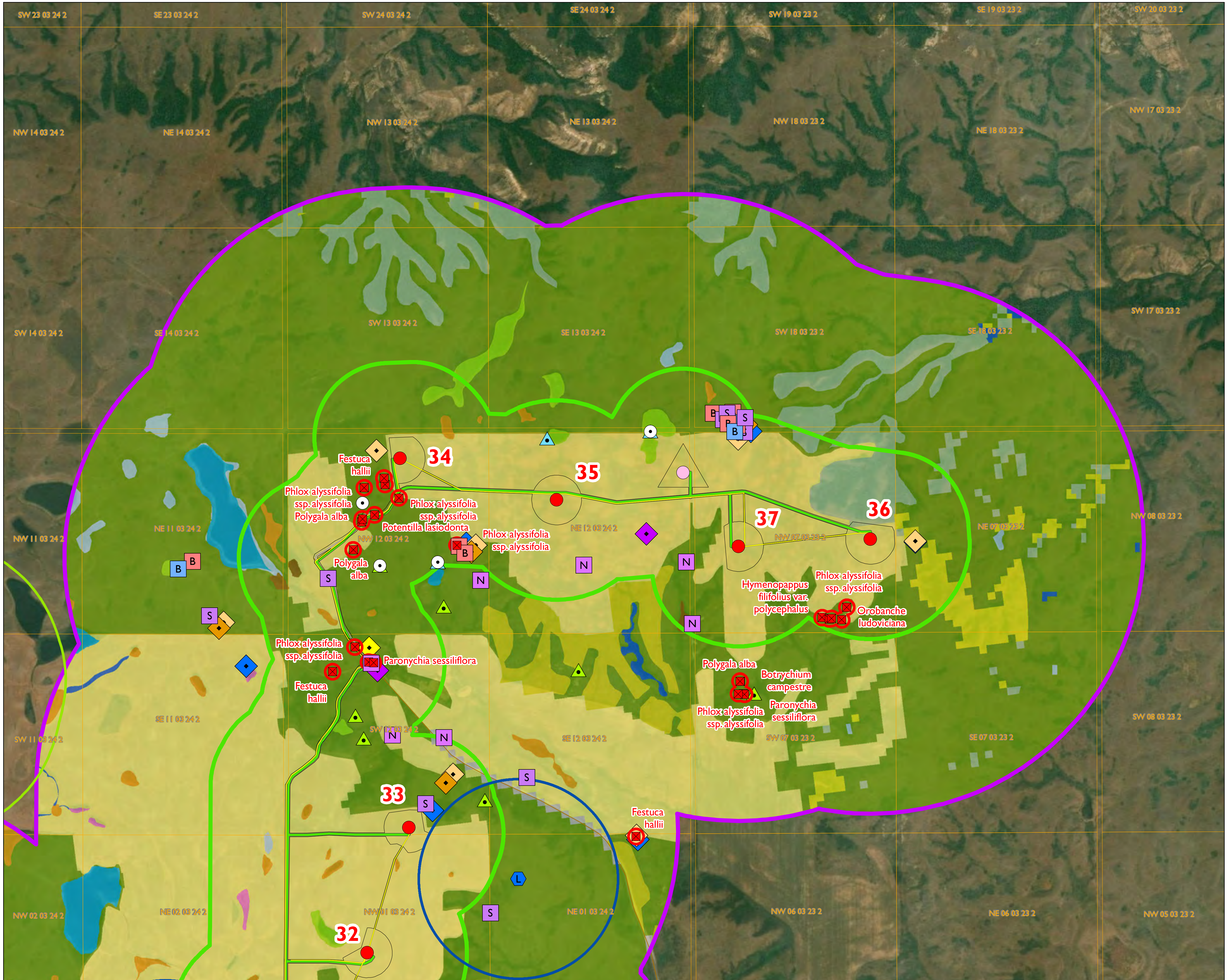

OUTLAW TRAIL WIND LP
OUTLAW TRAIL WIND ENERGY PROJECT

BluEarth RENEWABLES FHQ

FIGURE G - 8
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Proposed Project Layout

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Spatial Boundaries

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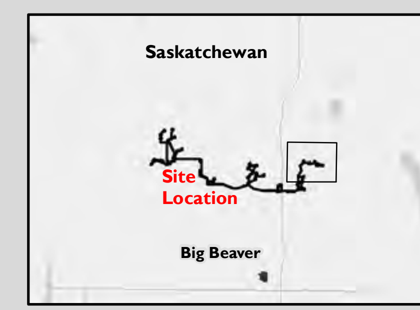

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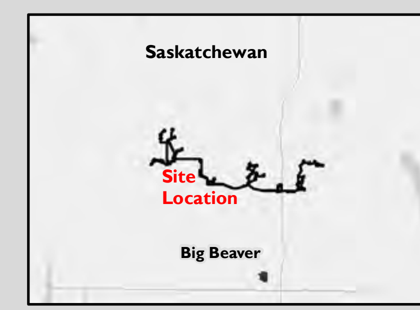

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PROJECT: 191825
STATUS: FINAL

Appendix H

Vegetation and Wetlands Supplementary Information

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Table H.1: Comprehensive List of Observed Vascular Plant Species

Scientific Name	Common Name	Status		
		G-Rank	N-Rank	S-Rank
Achillea millefolium	common yarrow	G5	NNR	S5
Agropyron cristatum ssp. pectinatum	crested wheatgrass	G5TNR	NNA	SNA
Agrostis scabra var. scabra	hair grass	G5T5	NNR	S4
Alisma triviale	broad-leaved water plantain	G5	N5	S4
Alopecurus aequalis var. aequalis	short-awn meadow-foxtail	G5T5	N5	S4
Alopecurus pratensis	meadow foxtail	GNR	NNA	SNA
Androsace septentrionalis	pygmyflower	G5	N5	S5
Anemone patens var. multifida	prairie crocus	G5T5	N5	S5
Antennaria microphylla	small-leaved pussy-toes	G5	N5	S5
Antennaria neglecta	broad-leaved pussytoes	G5	N5	S4
Antennaria sp.	pussytoes species			
Apocynum androsaemifolium	spreading dogbane	G5	N5	S4
Aralia nudicaulis	wild sarsaparilla	G5	N5	S4
Arctium minus	common burdock	GNR	NNA	SNA
Artemisia campestris ssp. caudata	plains sagewort	G5T5	N5	S4
Artemisia dracunculus	tarragon	G5	N5	S4
Artemisia frigida	pasture sage	G5	N5	S5
Artemisia ludoviciana ssp. ludoviciana	prairie sage	G5T5	N5	S5
Artemisia sp.	sage species			
Astragalus gilviflorus var. gilviflorus	cushion milk-vetch	G5T5	N5	S5
Astragalus lotiflorus	low milk-vetch	G5	N4N5	S4
Astragalus pectinatus	narrow-leaved milk-vetch	G5	N5	S4
Astragalus spp.	milk-vetch species			
Avenula hookeri	Hooker's oat grass	G5	N5	S5
Beckmannia syzigachne	slough grass	G5	N5	S4
Bidens frondosa	tall Beggar's-tick	G5	N5	S3
Boechera sp.	rockcress species			
Bouteloua gracilis	blue grama	G5	N5	S5
Bromus inermis	smooth brome	G5	NNA	SNA
Calamagrostis montanensis	plains reed grass	G5	N5	S5
Calamovilfa longifolia var. longifolia	long-leaved reed grass	G5T5	N5	S5
Campanula rotundifolia	harbell	G5	N5	S5
Carex atherodes	awned sedge	G5	N5	S4
Carex duriuscula	needle-leaved sedge	G5	N5	S5
Carex filifolia	thread-leaved sedge	G5	N5	S5
Carex inops ssp. heliophila	sun sedge	G5T5	N5	S5
Carex pellita	woolly sedge	G5	N5	S4
Carex sp.	carex species			

Scientific Name	Common Name	Status		
		G-Rank	N-Rank	S-Rank
Carex sprengelii	Sprengel's sedge	G5	N5	S5
Castilleja sessiliflora	downy paintbrush	G5	N3N4	S3
Cerastium arvense ssp. strictum	field mouse-ear chickweed	G5T5	N5	S5
Chenopodium album var. album	Lamb's quarter's	G5TNR	NNA	SNA
Chenopodium rubrum var. rubrum	red goosefoot	G5	N5	S4
Cirsium arvense	Canada thistle	G5	NNA	SNA
Cirsium flodmanii	Flodman's thistle	G5	N5	S4
Coeloglossum viride	long-bracted green bog orchid	G5	N5	S4
Comandra umbellata ssp. pallida	bastard toadflax	G5T5	N5	S5
Crataegus chrysocarpa	northern hawthorn	G5	N5	S4
Cryptantha celosioides	clustered oreocarya	G5	N4N5	S2
Dalea purpurea var. purpurea	purple prairie-clover	G5T5	N5	S4
Dasiphora fruticosa	shrubby cinquefoil	G5	N5	S4
Drymocallis arguta	white cinquefoil	G5	N5	S4
Echinacea angustifolia var. angustifolia	narrow-leaved purple conflower	G4T4	NNR	S3
Echinochloa muricata var. microstachya	rough barnyard grass	G5T5	N5	S4
Elaeagnus commutata	sliverberry	G5	N5	S4
Elatine triandra	longstem water-wort	G5	NNA	S2
Eleocharis acicularis	needle spike-rush	G5	N5	S4
Eleocharis palustris	creeping spike-rush	G5	N5	S4
Elymus lanceolatus ssp. lanceolatus	northern wheatgrass	G5T5	N5	S5
Elymus repens	creeping wild rye	GNR	NNA	SNA
Elymus trachycaulus ssp. trachycaulus	slender wheatgrass	G5T5	N5	S5
Elymus trachycaulus ssp. subsecundus	slender wheatgrass	G5T5	N5	S5
Erigeron caespitosus	tufted fleabane	G5	N5	S4
Erigeron glabellus var. glabellus	streamside fleabane	G5T5	N5	S5
Erigeron radicatus	dwarf fleabane	G3G4	N3N4	S3
Erigeron sp.	fleabane species			
Eriogonum flavum var. flavum	yellow umbrella plant	G5T5	NNR	S4
Erysimum asperum	western wallflower	G5	N4N5	S4
Erysimum sp.	wallflower species			
Festuca hallii	plains rough fescue	G5	N5	S3
Festuca saximontana var. saximontana	Rocky Mountain fescue	G5T5	N5	S5
Fraxinus pennsylvanica	green ash	G5	N5	S4
Gaillardia aristata	great-flowered gaillardia	G5	N5	S4
Galium boreale	northern bedstraw	G5	N5	S5
Geum macrophyllum var. perincisum	large-leaved avens	G5T5	N5	S4
Geum triflorum var. triflorum	three-flowered avens	G5T5	N5	S5
Glyceria striata var. striata	fowl-manna grass	G5T5	N5	S4

Scientific Name	Common Name	Status		
		G-Rank	N-Rank	S-Rank
Gnaphalium palustre	western marsh cudweed	G5	N5	S5
Grindelia hirsutula	hairy gumweed	G5	N5	S5
Grindelia squarrosa	gumweed	G5	N5	S5
Gutierrezia sarothrae	broomweed	G5	N5	S4
Helianthus pauciflorus ssp. subrhomboideus	rhombic-leaved sunflower	G5T5	N4N5	S4
Helianthus spp.	sunflower			
Heracleum maximum	cow parsnip	G5	N5	S4
Hesperostipa comata ssp. comata	needle-and-thread grass	G5T5	N5	S5
Hesperostipa curtiseta	porcupine grass	G5	N5	S5
Hesperostipa sp.	needlegrass species			
Hesperostipa spartea	porcupine grass	G5	N4N5	S4
Heterotheca villosa var. villosa	hairy false golden-aster	G5T5	N5	S5
Heuchera richardsonii	alumroot	G5	N5	S4
Hordeum jubatum ssp. jubatum	fox-tail barley	G5T5	N5	S5
Hymenopappus filifolius var. polycephalus	tufted hymenopappus	G5T4T5	N3	S3
Juncus balticus	Baltic rush	G5	N5	S4
Juniperus horizontalis	creeping juniper	G5	N5	S5
Koeleria macrantha	June grass	G5	N5	S5
Krascheninnikovia lanata	winter-fat	G5	N5	S4
Lactuca serriola	prickly lettuce	GNR	NNA	SNA
Lathyrus ochroleucus	cream-coloured vetchling	G5	N5	S4
Liatris punctata var. punctata	dotted blazing star	G5T5	N5	S5
Limosella aquatica	mudwort	G5	N5	S4
Linum lewisii var. lewisii	flax	G5T5	N5	S4
Lygodesmia juncea	skeleton-weed	G5	N5	S5
Lysimachia ciliata	fringed loosestrife	G5	N5	S4
Maianthemum stellatum	starflower false Solomon's-seal	G5	N5	S4
Marsilea vestita	pepperwort	G5	N3	S3
Medicago sativa ssp. sativa	alfalfa	GNRTNR	NNA	SNA
Melilotus officinalis	yellow sweet-clover	GNR	NNA	SNA
Melilotus sp.	sweet-clover species			
Mentha canadensis	wild mint	G5	N5	S4
Mertensia lanceolata var. lanceolata	prairie blubells	G5T5	NNR	S3
Moehringia lateriflora	blunt-leaved sandwort	G5	N5	S4
Monarda fistulosa var. menthifolia	wild bergamot	G5T5	NNR	S4
Muhlenbergia cuspidata	prairie muhly	G5	N4N5	S4
Muhlenbergia richardsonis	mat muhly	G5	N5	S4
Myosurus minimus	least mousetail	G5	N3N4	S3
Nassella viridula	green needlegrass	G5	N5	S5

Scientific Name	Common Name	Status		
		G-Rank	N-Rank	S-Rank
Orobanche fasciculata	clustered broom-rape	G4G5	N5	S4
Orobanche ludoviciana	Louisiana vroom-rape	G5	N3N4	S3
Oxalis stricta	yellow wood sorrel	G5	N5	S4
Oxytropis campestris var. spicata	northern yellow point-vetch	G5T5	N5	S4
Oxytropis spp.	locoweed species			
Packera cana	silvery groundsel	G5	N5	S4
Paronychia sessiliflora	low whitlowwort	G5	N3N4	S3
Pascopyrum smithii	western wheatgrass	G5	N5	S5
Pediomelum argophyllum	silvery scurf pea	G5	N5	S5
Pediomelum esculentum	Indian breadroot	G5	N4	S4
Penstemon albidus	white beardtongue	G5	N4	S4
Persicaria amphibia var. emersa	water smartweed	G5T5	N5	S4
Phalaris arundinacea	reed canary grass	G5	N5	S4
Phlox alyssifolia ssp. alyssifolia	blue wild phlox	G5TNR	NNR	S3
Phlox hoodii ssp. hoodii	moss phlox	G5T5	N5	S5
Physaria spatulata	spatulate bladderpod	G5TNR	NNR	S3
Physaria spp.	bladderpod species			
Poa interior	inland blue grass	G5T5	N5	S4
Poa pratensis	Kentucky blue grass	G5	N5	SNA
Poa secunda ssp. secunda	canby blue grass	G5T5	N5	S5
Polygala alba	white milkwort	G5	N3	S3
Populus balsamifera ssp. balsamifera	balsam poplar	G5T5	N5	S5
Populus tremuloides	trembling aspen	G5	N5	S5
Potentilla	cinquefoil species			
Potentilla concinna var. concinna	early cinquefoil	G5T5?	NNR	S2
Potentilla lasiodonta	sandhills cinquefoil	G3	N3	S2
Potentilla pensylvanica	prairie cinquefoil	G5	N5	S4
Prunus virginiana var. virginiana	chokecherry	G5T5	N5	S5
Ranunculus cymbalaria	seaside buttercup	G5	N5	S4
Ranunculus macounii	Macoun's buttercup	G5	N5	S4
Ratibida columnifera	prairie cone-flower	G5	N4N5	S4
Ribes oxyacanthoides ssp. oxyacanthoides	bristly gooseberry	G5T5	N5	S4
Rorippa curvipes	curved yellow-cress	G5	NNR	S3
Rosa acicularis ssp. sayi	prickly rose	G5T5	N5	S5
Rosa arkansana	low prairie rose	G5	N5	S5
Rosa blanda	smooth wild rose	G5	N5	S1
Rosa woodsii var. woodsii	Wood's rose	G5T5	N5	S5
Rubus idaeus ssp. strigosus	American red raspberry	G5T5	N5	S5
Rumex crispus	curled dock	GNR	NNA	SNA

Scientific Name	Common Name	Status		
		G-Rank	N-Rank	S-Rank
Sagittaria cuneata	arum-leaved arrowhead	G5	N5	S4
Salsola kali	Russian-thistle	GNR	NNA	SNA
Sanicula marilandica	black snakeroot	G5	N5	S4
Schizachyrium scoparium var. scoparium	little bluestem	G5T5	N5	S4
Schoenoplectus acutus var. acutus	hard-stemmed bulrush	G5T5	N5	S4
Selaginella densa var. densa	dense spike-moss	G5T5	N5	S4
Setaria viridis var. viridis	green foxtail	GNRTNR	NNA	SNA
Solidago gigantea	late goldenrod	G5	N5	S4
Solidago missouriensis	low goldenrod	G5	N5	S5
Sonchus arvensis ssp. arvensis	field sow-thistle	GNRTNR	NNA	SNA
Sonchus asper ssp. asper	spiny-leaved annual sow-thistle	GNRTNR	NNA	SNA
Sphaeralcea coccinea ssp. coccinea	scarlet mallow	G5T5	N5	S5
Stachys pilosa var. pilosa	hairy hedge-nettle	G5T5	N5	S4
Symphoricarpos albus var. albus	snowberry	G5T5	N5	S4
Symphoricarpos occidentalis	western snowberry	G5	N5	S5
Symphyotrichum ericoides var. pansum	tufted white prairie aster	G5T5	N5	S5
Symphyotrichum laeve var. geyeri	Geyer's aster	G5T5	N5	S5
Taraxacum officinale ssp. officinale	common dandelion	G5T5	NNA	SNA
Thalictrum venulosum	veiny meadow-rue	G5	N5	S4
Thermopsis rhombifolia	golden-bean	G5	N5	S5
Thlaspi arvense	stinkweed	GNR	NNA	SNA
Toxicodendron rydbergii	poison ivy	G5	N5	S4
Tragopogon dubius	yellow goat's-beard	GNR	NNA	SNA
Typha angustifolia	narrow-leaved cattail	G5	N5	SNA
Typha latifolia	common cattail	G5	N5	S4
Ulmus pumila	Siberian elm	GNR	NNA	SNA
Utricularia vulgaris	common bladderwort	G5	N5	S4
Veronica peregrina ssp. xalapensis	hairy speedwell	G5T5	N5	S4
Vicia americana ssp. americana	American purple vetch	G5T5	N5	S5
Viola adunca var. adunca	early blue violet	G5T5	N5	S5
Viola canadensis var. rugulosa	western Canada violet	G5T5	N5	S4
Viola spp.	violet species			
Xanthisma spinulosum var. spinulosum	spiny goldenaster	G5T4	N4N5	S4
Zizia aptera	heart-leaved alexanders	G5	N5	S4

Appendix I

Wildlife and Wildlife Habitat Supplementary Information

Table I.1: Federal and Provincial Species Ranking Definitions

Category	Definition
SK CDC[1]	
S1	Critically Imperiled/ Extremely Rare - At very high risk of extinction or extirpation due to extreme rarity, very steep declines, high threat level, or other factors.
S2	Imperiled/Very Rare - At high risk of extinction or extirpation due to a very restricted range, very few populations, steep declines, threats or other factors.
S3	Vulnerable/Rare to Uncommon - At moderate risk of extinction or extirpation due to a restricted range, relatively few populations, recent and widespread declines, threats, or other factors.
S4	Apparently Secure - Uncommon but not rare; some cause for long-term concern due to declines or other factors.
S5	Secure/Common - Demonstrably secure under present conditions; widespread and abundant; low threat level.
Range Rank	Such as S3S4, is used when the taxon straddles the criteria for more than one rank (i.e. S3 and S4).
Modifiers for SK CDC Ranks[1]	
A	Accidental or causal in the province, including species recorded infrequently that are far outside their range.
B	For a migratory species, applies to the breeding population in the province.
N	For a migratory species, applies to the non-breeding population in the province.
M	For a migratory species, rank applies to the transient (migrant) population.
H	Historical occurrence of the taxon, without recent verification (e.g. 20-40 years or older).
U	Status is uncertain in Saskatchewan because of limited or conflicting information (unrankable).
X	Believed to be extinct or extirpated from the province.
NA	Rank is not yet assigned or species has not yet been assessed (not ranked).
NR	Conservation status is not applicable to the species (e.g. it may have been determined to have been introduced in Saskatchewan).
?	A "?" following a rank means that there is some uncertainty associated with it. For example, a rank of S3? means that it is believed to be most likely an S3, but there is a significant chance that it could be an S2 or S4.
SK Wildlife Act[2]	
Extirpated	A native wild species that no longer exists in the wild in Saskatchewan, but exists in the wild outside of Saskatchewan.
Endangered	A native wild species that is threatened with imminent extirpation or extinction.
Threatened	A native wild species that is likely to become endangered if the factors leading to its endangerment are not reversed.
Vulnerable	A native wild species that is of special concern because of low or declining numbers due to human activities or natural events but that is not endangered or threatened.

Category	Definition
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 a threatened or an endangered species because of a combination of biological characteristics and identified threats.
COSEWIC[4]	
Extinct	A species that no longer exists.
Extirpated	A species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered	A species facing imminent extirpation or extinction.
Threatened	A species likely to become endangered if limiting factors are not reversed.
Special Concern	A species of special concern because of characteristics that make it particularly sensitive to human activities or natural events.
Data Deficient	A species for which there is insufficient scientific information to support status designation.
Not At Risk	A species that has been evaluated and found to be not at risk.

Notes:

[1] SK CDC 2020b

[2] Government of Saskatchewan 1998

[3] Government of Canada 2002

[4] COSEWIC 2019

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Table I.2: Wildlife SOMC with Potential to Occur in the Wildlife RAA

Common Name	Latin Name	SARA[1]	COSEWIC[1]	ENV[2]	SK CDC[3]	SK Activity Restriction Feature and Setback[4]
Invertebrates						
Dusky dune moth	Copablepharon longipenne	Endangered	Endangered		S1	
Gypsy cuckoo bumble bee	Bombus bohemicus	Endangered	Endangered		S1	
Monarch	Danaus plexippus	Special concern	Endangered		S2B	
Nine-spotted lady beetle	Coccinella novemnotata		Endangered		S4	
Pale yellow dune moth	Copablepharon grandis	Special concern	Special concern		S2	
Rhesus skipper	Polites rhesus				S2	
Verna's flower moth	Schinia verna	Threatened	Threatened		S1	
Western bumble bee	Bombus occidentalis		Special concern		S4	
Yellow-banded bumble bee	Bombus terricola	Special concern	Special concern		S5	
Herptiles						
Bullsnake	Pituophis catenifer sayi		Special concern		S4	
Canadian toad	Anaxyrus hemiophrys		Not at risk		S4	Breeding and overwintering habitat (90 m)
Eastern yellow-bellied racer	Coluber constrictor flaviventris	Threatened	Threatened		S2	Hibernacula (200 m)
Great plains toad	Anaxyrus cognatus	Special concern	Special concern		S3	Breeding and overwintering habitat (500 m)
Northern leopard frog	Lithobates pipiens	Special concern	Special concern		S3	Breeding and overwintering habitat (500 m)

Common Name	Latin Name	SARA[1]	COSEWIC[1]	ENV[2]	SK CDC[3]	SK Activity Restriction Feature and Setback[4]
Plains hog-nosed snake	Heterodon nasicus		Special concern		S3	Hibernacula (200 m)
Plains spadefoot	Spea bombifrons		Not at risk		S3	Breeding and overwintering habitat (90 m)
Smooth greensnake	Opheodrys vernalis				S4	Hibernacula (200 m)
Western tiger salamander	Ambystoma mavortium	Special concern	Special concern		S4	
Upland Game Bird						
Sharp-tailed grouse	Tympanuchus phasianellus				S5	Lek (400 m)
Raptors						
Bald eagle	Haliaeetus leucocephalus		Not at risk		S5B,S5N,S4M	Nest site (1000 m)
Burrowing owl	Athene cunicularia	Endangered	Endangered	Endangered	S2B,S2M	Breeding bird (500 m)
Cooper's hawk	Accipiter cooperii		Not at risk		S4B,S2N,S2M	Nest site (400 m)
Ferruginous hawk	Buteo regalis	Threatened	Threatened		S3B	Nest site (1000 m)
Golden eagle	Aquila chrysaetos		Not at risk		S3B,S3N,S4M	Nest site (1000 m)
Osprey	Pandion haliaetus				S2B,S2M	Nest site (1000 m)
Peregrine falcon	Falco peregrinus anatum	Special concern	Not at risk		S1B,SNRM	Nest site (1000 m)
Short-eared owl	Asio flammeus	Special concern	Special concern		S3B,S2N,S3M	Breeding bird (500 m)
Migratory Birds						
American bittern	Botaurus lentiginosus				S5B	Breeding bird (350 m)
American white pelican	Pelecanus erythrorhynchos		Not at risk		S5B,S5M	Nesting colony (1000 m)
Baird's sparrow	Ammodramus bairdii	Special concern	Special concern		S4B	
Bank swallow	Riparia riparia	Threatened	Threatened		S4B,S5M	

Common Name	Latin Name	SARA[1]	COSEWIC[1]	ENV[2]	SK CDC[3]	SK Activity Restriction Feature and Setback[4]
Barn swallow	Hirundo rustica	Threatened	Threatened		S5B,S5M	
Black-crowned night-heron	Nycticorax nycticorax				S4B	Nesting colony (1000 m)
Black tern	Chlidonias niger		Not at risk		S5B,S5M	Nesting colony (400 m)
Boblink	Dolichonyx oryzivorus	Threatened	Threatened		S4B,S4M	
Buff-breasted sandpiper	Calidris subruficollis	Special concern	Special concern		S4M	
Cattle egret	Bubulcus ibis				SNA	Nesting colony (1000 m)
Chestnut-collared longspur	Calcarius ornatus	Threatened	Endangered		S3B	Breeding bird (200 m)
Common nighthawk	Chordeiles minor	Threatened	Special concern		S4B,S4M	Breeding bird (200 m)
Common tern	Sterna hirundo				S5B.S5M	Nesting colony (400 m)
Double-crested cormorant	Phalacrocorax auritus		Not at risk		S5B,S5M	Nesting colony (1000 m)
Eared grebe	Podiceps nigricollis				S5B,S5M	Breeding bird or breeding colony (200 m)
Forster's tern	Sterna forsteri		Data deficient		S4B.S4M	Nesting colony (400 m)
Franklin's gull	Leucophaeus pipixcan				S4B,S4M	Nesting colony (400 m)
Great blue heron	Ardea herodias	Special concern	Special concern		S5B	Nesting colony (1000 m)
Great egret	Ardea alba				SNA	Nesting colony (1000 m)
Herring gull	Larus argentatus				S4B.S5M	Nesting colony (400 m)
Horned grebe	Podiceps auritus	Special concern	Special concern		S5B,S5M	Breeding bird or breeding colony (200 m)
Lark bunting	Calamospiza melanocorys	Threatened	Threatened		S2B,S2M	

Common Name	Latin Name	SARA[1]	COSEWIC[1]	ENV[2]	SK CDC[3]	SK Activity Restriction Feature and Setback[4]
Loggerhead shrike	Lanius ludovicianus excubitorides	Threatened	Threatened		S2B,S2M	Breeding bird (400 m)
Long-billed curlew	Numenius americanus	Special concern	Special concern		S3B,S4M	Breeding bird (200 m)
McCown's longspur	Rhynchophanes mccownii	Threatened	Threatened		S3B	Breeding bird (200 m)
Piping plover	Charadrius melodus circumcinctus	Endangered	Endangered	Endangered	S3B	High-water mark (600 m)
Red knot	Calidris canutus rufa	Endangered	Endangered		S2M	Staging area (1000 m)
Red-necked phalarope	Phalaropus lobatus	Special concern	Special concern		S4B,S3M	
Rusty blackbird	Euphagus carolinus	Special concern	Special concern		S3B,SUN,S3M	Breeding bird (300 m)
Snowy egret	Egretta thula				SNA	Nesting colony (1000 m)
Snowy plover	Charadrius nivosus nivosus				SHB	High-water mark (600 m)
Sprague's pipit	Anthus spragueii	Threatened	Threatened		S3B,S3M	Breeding bird (250 m)
Western Grebe	Aechmophorus occidentalis	Special concern	Special concern		S3B,S3M	Breeding bird or breeding colony (200 m)
Whooping crane	Grus americana	Endangered	Endangered	Endangered	SXB,S1M	Staging area (1000 m)
Yellow rail	Coturnicops noveboracensis	Special concern	Special concern		S3B,S3M	Breeding bird (350 m)
Mammals						
American badger	Taxidea taxus taxus	Special concern	Special concern		S3	
Big brown bat	Eptesicus fuscus				S5	Roost/foraging site (500 m)
Eastern red bat	Lasiurus borealis				S4B	Roost/foraging site (500 m)
Hoary bat	Lasiurus cinereus				S5B	Roost/foraging site (500 m)
Little brown myotis	Myotis lucifugus	Endangered	Endangered		S4B,S4N	Roost/foraging site (500 m)

Common Name	Latin Name	SARA[1]	COSEWIC[1]	ENV[2]	SK CDC[3]	SK Activity Restriction Feature and Setback[4]
Long-eared myotis	Myotis evotis	Endangered	Endangered		S2B,S2N	Roost/foraging site (500 m)
Northern myotis	Myotis septentrionalis	Endangered	Endangered		S3	Roost/foraging site (500 m)
Silver-haired bat	Lasionycteris noctivagans				S5B	Roost/foraging site (500 m)
Western small-footed myotis	Myotis ciliolabrum				S2	Roost/foraging site (500 m)

Notes:

1 Government of Canada 2020

2 Government of Saskatchewan 1999

3 SK CDC 2020a

4 ENV 2017

Table I.3: Habitat Associations for Wildlife SOMC with Potential to Occur in the Wildlife RAA

Common Name	Latin Name	Native Grassland	Tame Pasture	Hayland	Cultivated	Shrubland	Developed	Exposed/ barren	Water	Wetland
Invertebrates[1]										
Dusky dune moth	Copablepharon longipenne							X		
Gypsy cuckoo bumble bee	Bombus bohemicus	X	X			X	X			
Monarch	Danaus plexippus	X	X							
Nine-spotted lady beetle	Coccinella novemnotata	X	X	X	X	X	X			
Pale yellow dune moth	Copablepharon grandis							X		
Rhesus skipper	Polites rhesus	X								
Verna's flower moth	Schinia verna	X								
Western bumble bee	Bombus occidentalis	X	X	X	X	X	X			
Yellow-banded bumble bee	Bombus terricola	X	X	X	X	X	X			
Herptiles[2]										
Bullsnake	Pituophis catenifer sayi	X	X							
Canadian toad	Anaxyrus hemiophrys	X	X						X	X
Eastern yellow-bellied racer	Coluber constrictor flaviventris	X	X			X				
Great plains toad	Anaxyrus cognatus	X	X						X	X
Northern leopard frog	Lithobates pipiens	X	X						X	X
Plains hog-nosed snake	Heterodon nasicus	X	X			X				
Plains spadefoot	Spea bombifrons	X	X						X	X
Smooth greensnake	Opheodrys vernalis	X	X							
Western tiger salamander	Ambystoma mavortium	X	X						X	X
Upland Game Bird[3]										
Sharp-tailed grouse	Tympanuchus phasianellus	X	X			X				

Common Name	Latin Name	Native Grassland	Tame Pasture	Hayland	Cultivated	Shrubland	Developed	Exposed/ barren	Water	Wetland
Raptors[3]										
Bald eagle	Haliaeetus leucocephalus								X	
Burrowing owl	Athene cunicularia	X	X							
Cooper's hawk	Accipiter cooperii					X	X			
Ferruginous hawk	Buteo regalis	X	X			X				
Golden eagle	Aquila chrysaetos	X	X			X		X		
Osprey	Pandion haliaetus								X	
Peregrine falcon	Falco peregrinus anatum	X	X			X		X		
Short-eared owl	Asio flammeus	X	X							X
Migratory Birds[3]										
American bittern	Botaurus lentiginosus								X	X
American white pelican	Pelecanus erythrorhynchos								X	X
Baird's sparrow	Ammodramus bairdii	X	X							
Bank swallow	Riparia riparia							X	X	X
Barn swallow	Hirundo rustica	X	X				X		X	X
Black-crowned night-heron	Nycticorax nycticorax								X	X
Black tern	Chlidonias niger								X	X
Bobolink	Dolichonyx oryzivorus	X	X	X						
Buff-breasted sandpiper	Calidris subruficollis								X	X
Cattle egret	Bubulcus ibis								X	X
Chestnut-collared longspur	Calcarius ornatus	X								
Common nighthawk	Chordeiles minor	X	X			X	X	X		
Common tern	Sterna hirundo								X	X
Double-crested cormorant	Phalacrocorax auritus								X	X

Common Name	Latin Name	Native Grassland	Tame Pasture	Hayland	Cultivated	Shrubland	Developed	Exposed/ barren	Water	Wetland
Eared grebe	Podiceps nigricollis								X	X
Forster's tern	Sterna forsteri								X	X
Franklin's gull	Leucophaeus pipixcan								X	X
Great blue heron	Ardea herodias								X	X
Great egret	Ardea alba								X	X
Herring gull	Larus argentatus						X		X	X
Horned grebe	Podiceps auritus								X	X
Lark bunting	Calamospiza melanocorys	X	X							
Loggerhead shrike	Lanius ludovicianus excubitorides	X	X			X				
Long-billed curlew	Numenius americanus	X								
McCown's longspur	Rhynchophanes mccownii	X	X							
Piping plover	Charadrius melodus circumcinctus	X							X	X
Red knot	Calidris canutus rufa								X	X
Red-necked phalarope	Phalaropus lobatus								X	X
Rusty blackbird	Euphagus carolinus								X	X
Snowy egret	Egretta thula								X	X
Snowy plover	Charadrius nivosus nivosus							X	X	X
Sprague's pipit	Anthus spragueii	X	X							
Western Grebe	Aechmophorus occidentalis								X	X
Whooping crane	Grus americana				X				X	X
Yellow rail	Coturnicops noveboracensis								X	X

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Common Name	Latin Name	Native Grassland	Tame Pasture	Hayland	Cultivated	Shrubland	Developed	Exposed/ barren	Water	Wetland
Mammals[4]										
American badger	Taxidea taxus taxus	X	X	X						
Big brown bat	Eptesicus fuscus		X	X	X		X			
Eastern red bat	Lasiurus borealis									
Hoary bat	Lasiurus cinereus						X			
Little brown myotis	Myotis lucifugus						X		X	X
Long-eared myotis	Myotis evotis						X			
Northern myotis	Myotis septentrionalis									
Silver-haired bat	Lasionycteris noctivagans								X	X
Western small-footed myotis	Myotis ciliolabrum	X	X							X
Totals		35	31	6	5	13	12	7	35	35

Notes:

[1] Government of Canada 2002

[2] Stebbins 2003

[3] Cornell Lab or Ornithology and the American Ornithologist's Union 2020

[4] Reid 2006

Table I.4: All Wildlife Species Observed During the 2015, 2016, 2017 and 2019 Field Studies

Common Name	Latin Name	SARA[1,2]	COSEWIC[1,2]	SK CDC[1,3]
Herptiles				
Boreal chorus frog	Pseudacris maculata		Not at risk	S5
Northern leopard frog	Lithobates pipiens	Special concern	Special concern	S3
Smooth greensnake	Opheodrys vernalis			S4
Wood Frog	Lithobates sylvaticus			S5
Birds				
American crow	Corvus brachyrhynchos			S5B,S4N,S5M
American goldfinch	Spinus tristis			S5B
American kestrel	Falco sparverius			S5B,S1N,S5M
American robin	Turdus migratorius			S5B,SUN,S5M
American wigeon	Mareca americana			S5B,S2N,S5M
Baird's sparrow	Ammodramus bairdii	Special concern	Special concern	S4B
Barn swallow	Hirundo rustica	Threatened	Threatened	S5B,S5M
Black-and-white warbler	Mniotilta varia			S5B,S5M
Black-billed magpie	Pica hudsonia			S5
Blue-winged teal	Spatula discors			S5B,S5M
Bobolink	Dolichonyx oryzivorus	Threatened	Threatened	S4B,S4M
Brewer's blackbird	Euphagus cyanocephalus			S4B,SUN,S4M
Brown-headed cowbird	Molothrus ater			S5B,SUN,S5M
Brown thrasher	Toxostoma rufum			S5B,S5M
California gull	Larus californicus			S4B,S4M
Canada goose	Branta canadensis			S5B,S2N,S5M
Chestnut-collared longspur	Calcarius ornatus	Threatened	Endangered	S3B
Chestnut-sided warbler	Setophaga pensylvanica			S5B,S5M
Clay-coloured sparrow	Spizella pallida			S5B,S5M
Common grackle	Quiscalus quiscula			S5B
Common nighthawk	Chordeiles minor	Threatened	Special concern	S4B,S4M
Common raven	Corvus corax			S5
Common yellowthroat	Geothlypis trichas			S5B,S5M
Cooper's hawk	Accipiter cooperii		Not at risk	S4B,S2N,S2M

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Common Name	Latin Name	SARA[1,2]	COSEWIC[1,2]	SK CDC[1,3]
Double-crested cormorant	Phalacrocorax auritus		Not at risk	S5B,S5M
Eastern kingbird	Tyrannus tyrannus			S5B,S5M
European starling	Sturnus vulgaris			SNA
Ferruginous hawk	Buteo regalis	Threatened	Threatened	S3B
Franklin's gull	Leucophaeus pipixcan			S4B,S4M
Gadwall	Mareca strepera			S5B,S2N,S5M
Golden eagle	Aquila chrysaetos		Not at risk	S3B,S3N,S4M
Grasshopper sparrow	Ammodramus savannarum			S4B
Gray catbird	Dumetella carolinensis			S5B,S5M
Great blue heron	Ardea herodias			S5B
Great horned owl	Bubo virginianus			S4
Green-winged teal	Anas crecca			S5B,S2N,S5M
Horned lark	Eremophila alpestris			S4B,S3N,SUM
House wren	Troglodytes aedon			S5B,S5M
Killdeer	Charadrius vociferus			S5B,S5M
Lark bunting	Calamospiza melanocorys	Threatened	Threatened	S2B,S2M
Least flycatcher	Empidonax minimus			S5B,S5M
Le Conte's sparrow	Ammodramus leconteii			S5B,S5M
Lesser scaup	Aythya affinis			S5B,S3N,S5B
Long-billed curlew	Numenius americanus	Special concern	Special concern	S3B,S4M
Mallard	Anas platyrhynchos			S5B,S5M
Marbled godwit	Limosa fedoa			S4B,S4M
Merlin	Falco columbarius		Not at risk	S5B,S5N,S5M
Mountain bluebird	Sialia currucoides			S4B,S4M
Mourning dove	Zenaida macroura			S5B,S5M
Northern flicker	Colaptes auratus			S5B,SUN,S5M
Northern harrier	Circus hudsonius		Not at risk	S4B,S4M
Northern pintail	Anas acuta			S5B,S4N,S5M
Northern shoveler	Spatula clypeata			S5B,S5M
Osprey	Pandion haliaetus			S2B,S2M
Ovenbird	Seiurus aurocapilla			S5B,S5M
Prairie falcon	Falco mexicanus		Not at risk	S3B,S3N,S3M
Red-necked phalarope	Phalaropus lobatus	Special concern	Special concern	S4B,S3M

Common Name	Latin Name	SARA[1,2]	COSEWIC[1,2]	SK CDC[1,3]
Red-tailed hawk	Buteo jamaicensis		Not at risk	S5B,S1N,S5M
Red-winged blackbird	Agelaius phoeniceus			S5B,SUN,S5M
Ring-billed gull	Larus delawarensis			S5B,S5M
Ring-necked pheasant	Phasianus colchicus			SNA
Rock pigeon	Columba livia			SNA
Savannah sparrow	Passerculus sandwichensis			S5B,S5M
Sharp-shinned hawk	Accipiter striatus		Not at risk	S4B,S2N,S4M
Sharp-tailed grouse	Tympanuchus phasianellus			S5
Short-eared owl	Asio flammeus	Special concern	Special concern	S3B,S2N,S3M
Song sparrow	Melospiza melodia			S5B,S5M
Spotted towhee	Pipilo maculatus			S3B,S5M
Sora	Porzana carolina			S5B,S5M
Sprague's pipit	Anthus spragueii	Threatened	Threatened	S3B,S3M
Swainson's hawk	Buteo swainsoni			S4B.S4M
Tree swallow	Tachycineta bicolor			S5B,S5M
Tundra swan	Cygnus columbianus			S5M
Turkey vulture	Cathartes aura			S3B,S3M
Upland sandpiper	Bartramia longicauda			S5B,S5M
Vesper sparrow	Pooecetes gramineus			S5B,S5M
Warbling vireo	Vireo gilvus			S5B,S5M
Western kingbird	Tyrannus verticalis			S5B,S5M
Western meadowlark	Sturnella neglecta			S4B,S4M
Western wood-pewee	Contopus sordidulus			S4B,S4M
Willet	Catoptrophorus semipalmatus			S4B,S4M
Wilson's phalarope	Phalaropus tricolor			S5B.S5M
Wilson's snipe	Gallinago delicata			S5B,S5M
Yellow-breasted chat	Icteria virens		Not at risk	S3B,S3M
Yellow-headed blackbird	Xanthocephalus xanthocephalus			S5B,S5M
Yellow-rumped warbler	Setophaga coronata			S5B,S5M
Yellow warbler	Setophaga petechia			S5B,S5M

Common Name	Latin Name	SARA[1,2]	COSEWIC[1,2]	SK CDC[1,3]
Mammals				
American badger	Taxidea taxus taxus	Special concern	Special concern	S3
Big brown bat	Eptesicus fuscus			S5
Bobcat	Lynx rufus			S3
Coyote	Canis latrans			S5
Eastern red bat	Lasiurus borealis			S4B
Elk	Cervus canadensis			S4
Hoary bat	Lasiurus cinereus			S5B
Little brown myotis	Myotis lucifugus	Endangered	Endangered	S4B,S4N
Long-eared myotis	Myotis evotis			S2B,S2N
Moose	Alces americanus			S5
Mule deer	Odocoileus hemionus			S4
Silver-haired bat	Lasionycteris noctivagans			S5B
Western small-footed myotis	Myotis ciliolabrum			S2
White-tailed deer	Odocoileus virginianus			S4

Notes:

[1] See Table I.1 for provincial and federal ranking definitions.

[2] Government of Canada 2020

[3] SK CDC 2020

I.5 Bat Activity Survey Technical Report

OUTLAW TRAIL WIND ENERGY PROJECT 2015-2016 PRE-CONSTRUCTION BAT MONITORING REPORT

Prepared for:

Prepared by:

Project Number: 113253956

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Executive Summary

BluEarth Renewables Inc. (BluEarth) is proposing to develop a wind energy project (the Project) in the rural municipalities of Hart Butte (RM. No. 11) and Happy Valley (RM. No. 10), Saskatchewan. The Project is located approximately 20 km east of the village of Coronach, in south-central Saskatchewan, and approximately 14 km north of the US/Canada border. The Project is proposed to be up to 200 MW with a maximum of 50 wind turbine generators (WTGs). BluEarth is applying for 60 WTG locations, including 10 alternative locations. Bat mortality risk is one important regulatory concern for wind projects and a passive bat detection program was, therefore, recommended in the pre-feasibility assessment of the Project area (Stantec 2015). Passive bat detection was conducted during the fall monitoring period (July 14 to September 30) in 2015, and spring (May 1 to June 7) and fall (July 28 to September 14) in 2016 using 11 detectors. Eight detectors were placed at four meteorological (MET) Towers (four low elevation and four high elevation detectors) in the Project area, and one detector at each of three additional ground stations during each monitoring period.

The purpose of the monitoring was to estimate bat activity in the Project area during the monitoring periods as has been previously requested by Saskatchewan Ministry of Environment (MOE) for other wind energy project bat assessments. Results were also put in context of the Alberta Environment and Parks (AEP) recommended fall migration period of August 1 to September 10 for regulatory considerations (ESRD 2013) as the MOE currently does not have wind energy guidelines specific to assessing bats for wind energy projects, and therefore those established by AEP were used as a reference.

Overall, bat activity varied by species at each monitoring station. Over the Alberta AEP recommended monitoring period (August 1 – September 10), 2.0 migratory bat passes per detector night were recorded at High detectors in 2015 and 2.4 migratory bat passes per detector night were recorded at High detectors in 2016. *Myotis* species and the big brown/silver-haired bat grouping were the most common species/species grouping of bats observed during all three monitoring periods (fall 2015, spring 2016 and fall 2016). The main contributing factors to observed bat activity levels in the Project area appear to be topography and habitat.

Abbreviations

ABAT	Alberta Bat Action Team
ACA	Alberta Conservation Association
BluEarth	BluEarth Renewables Inc.
CF	Compact Flash
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
ECCC	Environment and Climate Change Canada
ESRD	Alberta Environment and Sustainable Resource Development (Currently Alberta Environment and Parks)
LLD	Legal Land Description
km	Kilometres
km/h	Kilometres per hour
m	Metres
ms	Millisecond
m/s	Metres per second
MET	Meteorological
MNRF	Ontario Ministry of Natural Resources and Forestry
PVC	Polyvinyl chloride
MOE	Saskatchewan Ministry of Environment
SARA	*Species at Risk Act*
SK	Saskatchewan
SRD	Alberta Sustainable Resource Development (Currently Alberta Environment and Parks)
Stantec	Stantec Consulting Ltd.
UTM	Universal Transverse Mercator

1.0 INTRODUCTION

BluEarth Renewables Inc. (BluEarth) is proposing to develop a wind energy project (the Project) in the rural municipalities of Hart Butte (RM. No. 11) and Happy Valley (RM. No. 10), Saskatchewan. The Project is located approximately 20 km east of the village of Coronach, in south-central Saskatchewan, and approximately 14 km north of the US/Canada border (Figure 2-1). The Project is proposed to be up to 200 MW with a maximum of 50 wind turbine generators (WTGs). BluEarth is applying for 60 WTG locations, including 10 alternative locations. The Big Muddy Valley borders the Project area to the north. The proposed Project area is located on private and leased crown land consisting of native and cultivated lands.

In 2015, Stantec Consulting Ltd. (Stantec) conducted a pre-feasibility assessment identifying bat mortality as a potential Project effect. As a result, Stantec recommended acoustic bat activity surveys be conducted as part of a comprehensive pre-feasibility evaluation (Stantec 2015). Two rounds of fall and one round of spring acoustic monitoring survey were therefore conducted from 2015 to 2016. This report summarizes the results of the 2015 and 2016 bat acoustic surveys and will contribute to the assessment of potential mortality risk in the Project area.

1.1 BACKGROUND

In recent years, bat collision fatality rates at wind energy facilities, particularly for migratory tree-roosting bats, have become an increasing concern (Arnett et al. 2008, Arnett and Baerwald 2013, BSC et al. 2017, Zimmerling and Francis 2016). Fatalities occur when bats are struck by rotating turbine blades and to a lesser extent by barotrauma due to a sudden drop in air pressure around the moving blade (Baerwald et al. 2008, Cryan and Barclay 2009). Recent studies have determined barotrauma to be of less importance (approximately 10% of fatalities) than originally thought for causes of fatality (Grodsky et al. 2011, Rollins et al. 2012). Whole project and individual turbine siting in relation to bat activity levels is likely an important factor influencing potential bat fatality rates (Baerwald and Barclay 2011).

Current research shows that most bat fatalities at wind power developments occur during fall migration. In most studies, fatalities of migratory species are higher than resident species, particularly in the prairie biome (Arnett et al. 2008, Arnett and Baerwald 2013, BSC et al 2017). Few wind facilities exist in SK, and mortality monitoring reports are not available in the public domain. However, experience regarding bat and wind turbine interactions at existing wind power facilities in Alberta appear to be similar to those identified across North America, and may be representative of SK interactions. In Alberta, during the fall migration (July 15 to September 30) bat fatalities consist mainly of hoary and silver-haired bats (Baerwald et al. 2008, Lausen et al. 2010). Estimated corrected fatality rates of bats in Alberta have been determined for a variety of wind facilities averaging 7.31 ± 1.32 bats/turbine/year (BSC et al. 2017). Potential factors increasing the susceptibility of bats to collisions with turbines during migration include: abundance of individuals in flight, higher flight altitudes than resident bats, lower use of echolocation during migration, foraging differences between migrants and residents, and attractiveness of turbines to bats as potential resources for feeding, social, and mating opportunities (Cryan and Barclay 2009).

Geography may also play a role in bat activity levels, and therefore with collision fatality risk. Migration routes may be associated with the availability of suitable roosting sites (i.e., trees) and landmarks (e.g., river valleys), resulting in higher bat activity levels and fatality risk in those areas (Lausen et al. 2010). Activity levels of resident bats (Myotis species) are correlated with suitable roosting sites and prey availability; though they tend to feed at lower altitudes and are much less susceptible to collision strikes than migratory bat species.

1.2 REGULATORY CONTEXT

Bats are protected under the *Wildlife Act* of Saskatchewan, and under the *Species at Risk Act* for those species listed as endangered in Canada. As no Saskatchewan guidelines pertaining to bats exist, Alberta guidelines were used as context to the potential magnitude of effects. MOE regularly directs proponents to AEP guidance and survey protocols where none have been published in Saskatchewan, and previous experience with the MOE pertaining to assessment of effects to bats from wind developments in Saskatchewan confirms their reliance on the AEP guidance.

The *Bat Mitigation Framework for Wind Power Development* (ESRD 2013) establishes guidelines for interpreting pre-construction acoustic bat monitoring data for potential mitigation. This guidance document indicates potential fatality rates and acceptable activity levels based on bat passes per elevated (> 30 m height) detector night during the period identified in Lausen et al. (2010) for use in evaluating sites and applying mitigation. The thresholds of bat activity identified in ESRD (2013) are:

- Less than 1 migratory bat pass per detector night as potentially acceptable.
- 1 to 2 migratory bat passes per detector night as potentially requiring mitigation such as alternative siting locations and reduced turbine height or rotor length.
- Greater than 2 migratory bat passes per detector as likely requiring mitigation such as alternative turbine locations and changing cut-in speeds to reduce bat fatality.

However, the correlation used to derive these threshold guidelines was relatively weak ($r^2 = 0.31$, $P = 0.023$) and based on only five data points (Baerwald and Barclay 2009); moreover, other studies have not been able to reproduce a statistically significant relationship with greater datasets. This suggests that pre-construction survey data should be interpreted carefully.

2.0 METHODS

To design the bat activity studies for the Project, methods provided in Lausen et al. (2010) were followed. This document provides methods for acoustic bat surveys for consistent sampling, including a fall survey period from August 1 to mid-September, survey timing, and detector placement based on project scale and landscape.

The fall monitoring periods for the Project began earlier and extended later than the Alberta Guideline Period (August 1 to September 10) recommended in the *Bat Mitigation Framework for Wind Power Development* (ESRD 2013). The longer fall monitoring periods were completed based on direction from the SK Ministry of Environment (MOE) for a previous bat activity monitoring program (MOE, Riley Schmidt, MOE, 2014, pers. comm).

Seasonality is also known to be a factor in bat activity, with higher levels of bat activity found in the fall. The 2017 final Wildlife Directive for Alberta Wind Energy Projects requires one year of spring and fall bat surveys. In addition, MOE has previously requested spring bat activity data for wind developments. Therefore, acoustic surveys during the spring monitoring period (May) were conducted to determine if seasonality is a major contributing factor in the Project area.

2.1 EQUIPMENT

A total of 11 AnaBat SD1 CF Bat Detectors (Titley Electronics) were installed at seven stations within the Project area. All detectors were powered by two HAZE or PowerKing (12 Volt 18 Ah) sealed lead acid batteries connected in parallel. To prevent exposure to the elements, the detectors were housed in an 8x8x4 cm PVC junction box enclosure, with an accompanying microphone pointing out of the junction box enclosure through a PVC elbow. To increase data collection quantity, division ratios were set to 8. Sensitivity was adjusted to the highest level, which did not produce ambient static during set up (below the squelch zone). Data were recorded and stored on compact flash (CF) cards. Detectors were programmed to record sound from 1900 hours to 0700 hours each night.

The bat call data was downloaded from the CF cards using CFC read storage ZCAIM interface (version 4.4u). The data collected were transcribed using the latest available software (AnalookW Version 4.2g).

2.2 MONITORING STATIONS

Two detectors were installed on each of the Project's four Meteorological Towers (MET) Towers; one at a low elevation (Low detector) (2 m) and one at a high elevation (High detector) (45-49 m) as listed in Table 2-1and shown on Figure 2-1. High detectors were installed with a pulley system developed by Stantec; heights were verified using a range finder. The power cable connecting High detectors to the battery source was secured to rope using zip ties and attached at the tower's base near the weather-proof battery container. High detectors were installed to provide information on bat activity within the likely turbine rotor-swept altitude, as ground (i.e., Low) detectors only reliably collect data on bats travelling from ground level up to approximately 30 m height (Titley Scientific 2015).

Ground level detectors (Ground 1, 2, and 3) were installed at three additional ground stations (Figure 2-1, Table 2-1 Site Information and Photos of the Outlaw Trail Bat Monitoring Stations) to better understand the spatial distribution of bat activity of the Project area and to further inform turbine siting. To maintain consistency in data collection and allow data comparison, the three ground detectors were installed using the same parameters (i.e., height, orientation and detector settings) as the four MET Low detectors. The ground stations were sited between MET Towers to provide even coverage of the Project area in locations similar to where turbines might be constructed (Figure 2-1). In 2016, Detector Ground 2 was relocated to provide a better coverage following changes in to the Project target lands; all other detector locations did not change during the three rounds of surveys.

Based on data from the Moose Jaw airport, prevailing winds in the region originate from the northwest (Aviador 2016). In the spring, bats are expected to migrate from the south, and in the fall, the north, but taking into account the prevailing wind direction, and for consistency, all detectors were oriented to the southeast in the spring and northeast in the fall. Orienting the microphones perpendicular to the prevailing wind direction, and assumed bat migration direction, provides a balance that increases potential bat detections while reducing interfering noise caused by prevailing winds.

Table 2-1 Site Information and Photos of the Outlaw Trail Bat Monitoring Stations

Monitoring Station	Location (LLD, UTM)	Site / Setup Description	Land Cover	Photo
Ground 1	NE-1-3-25-W2M; NAD 83, 13U, 482435, 5447608	Attached to a fence line with temporary PVC pipe at a height of approximately 2 m. Located north of road.	Native prairie to northwest. Cultivation to east and south. Treed coulee 700 m to north and extends 2 km north into badlands. Farmstead and treed wetland 700 m to southeast.	Photo orientation: facing west 

Monitoring Station	Location (LLD, UTM)	Site / Setup Description	Land Cover	Photo
Ground 2 (2015)	NW-30-02-24-W2M; NAD 83, 13U, 481625, 5450009	Attached to a fence line with temporary PVC pipe at a height of approximately 2 m. Located on south side of road.	Cultivated grain to south and native prairie to north. Treed coulees approximately 300 m to southeast, extensive coulees and badlands beginning 800 m to east. Wetland 400 m to northwest.	Photo Orientation: facing west 
Ground 2 (2016)	NE22-2-25-W2MNAD 83, 13U, 480534, 5443504	Attached to a fence line with temporary PVC pipe at a height of approximately 2 m. Located 50 m south of road.	Surrounded by cultivation, a small patch of trees approximately 1 km to southwest.	Photo Orientation: facing north 
Ground 3	NW-3-3-24-W2M; NAD 83, 13U, 487828, 5447719	Attached to a fence line with temporary PVC pipe at a height of approximately 2 m. Located 50 m south of road.	Native prairie to east, cultivated flax to west and south. A few small patches of shrubs approximately 500 m to north. Wetlands approximately 250 m to northwest and 600 m to southwest.	Photo Orientation: facing north 

Monitoring Station	Location (LLD, UTM)	Site / Setup Description	Land Cover	Photo
MET 1 (Met 1 High and Met 1 Low) MET Tower 3012	SW-15-03-25-W2M; NAD 83, 13U, 478248, 5450315	2 detectors were attached to the MET Tower: approximately 2 m and 45 m above ground	Located within cultivated field. Wetlands approximately 200 m to northwest. Treed coulees approximately 700 m to southwest. Patches of trees 350 m to southeast.	Photo Orientation: facing north 
MET 2 (Met 2 High and MET 2 Low) MET Tower 3010	NW-30-02-24-W2M; NAD 83, 13U, 485163, 5444624	2 detectors were attached to the MET Tower: approximately 2 m and 47 m above ground	Located within cultivated field. Slopes with native prairie approximately 200 m to east. Shrub shelter belt 400 m to north and treed shelterbelt 800 m to south.	Photo Orientation: facing east 
MET 3 (Met 3 High and Met 3 Low) MET Tower 3008	SE-8-3-24-W2M; NAD 83, 13U, 485869, 5449091	2 detectors were attached to the MET Tower: approximately 2 m and 49 m above ground	Located within native prairie, treed coulee 200 m to north, extends to badlands 900 m to north. Shrubby coulee approximately 400 m to south, cultivated field to the east.	Photo Orientation: facing west 

Monitoring Station	Location (LLD, UTM)	Site / Setup Description	Land Cover	Photo
MET 4 (Met 4 High and Met 4 Low) MET Tower 3011	SW-2-3-24-W2M; NAD 83, 13U, 490688, 5447060	2 detectors were attached to the MET Tower: approximately 2 m and 49 m above ground	Located within hay / tame pasture field. Native prairie approximately 200 m to north and south. Wetlands 500 m to northwest.	Photo Orientation: facing west 

2.2.1 Equipment Status Visits and Monitoring Issues

Electronic monitoring equipment can experience malfunctions and other technical issues. While maintenance visits were executed every two weeks to verify equipment function and replace batteries, malfunctions and partial data loss may occur during the interval between maintenance visits. These malfunctions are typically attributed to the following events:

- Lightning strikes: MET towers are susceptible to lightning strikes and detectors mounted to MET towers also become subject to frequent lightning strikes. These events usually result in a system shutdown of the detectors and possibly to data loss in the memory cards. This is the most common source of technical issues with acoustic bat detectors.

- Battery failure: battery maintenance and predictions of charge capacity of batteries used to power the detectors helps to prevent battery failure. However, moisture, extreme temperatures and other environmental conditions may cause premature battery fatigue. If batteries fall below a minimum charge capacity, detectors may fail to record for a period of time.

- Detector failure: technical issues with detectors, such as moisture or short-circuiting, may cause detector units to fail.

- Memory card capacity: while maximum capacity memory cards are used in the detectors, ambient noise may sometimes cause sound recording and fill memory cards, thus limiting the period when data may be collected.

The following summarizes the equipment data visits and any technical issues encountered during the three monitoring periods.

Fall 2015

Five stations (seven detectors) began collecting data on July 14, 2015 at 1900 hours (Ground 1, 2, and 3, MET 1 High, MET 1 Low, MET 2 High, and MET 2 Low), and the remainder on July 15, 2015 at 1900 hours (MET 3 High, MET 3 Low, MET 4 High, MET 4 Low). Equipment status checks were performed on July 30, August 12, September 1, and September 16, 2015. During these visits the CF cards and HAZE batteries were exchanged for empty cards and charged batteries. Data were retrieved from the cards and stored for interpretation at a future date. All detectors were removed on October 1, 2015.

Detectors Ground 2, Ground 3, MET 1 Low, MET 3 Low, MET 4 Low and MET 4 High were in operation for the entire monitoring period and complete datasets were collected. Five detectors malfunctioned during the fall 2015 monitoring period, accounting for approximately 8% of the total dataset. Malfunctions are summarized below and in Appendix A:

- Ground 1 did not collect data for 15 nights from September 1 to 15 due to card malfunctions
- MET 2 Low did not collect data for 14 nights from September 2 to 15 due to card malfunctions
- MET 1 High did not collect data for 23 nights from July 27 to 30, Aug 5 to 11, August 31, or September 4 to 14. due to unknown causes
- MET 2 High did not collect data for 14 nights from July 28 to 30 and August 13 to 23 due to unknown causes (possibly lighting)
- MET 3 High did not collect data for three nights from July 27 to 29 due to unknown causes (possibly lightning)

It is unknown as to why some of these detectors malfunctioned, but is likely due to lightning strikes. Some data malfunctions occurred during peak activity periods, particularly for MET 1 High and MET 2 High. However, the overall bat activity is calculated as bat passes per detector night, based on the number of operational nights during the monitoring period, and would not be biased by these malfunctions. Though this resulted in reduced sample size, with 11 stations, ample data were collected for the Project area despite the malfunctions.

Spring 2016

Three stations (four detectors) began collecting data on April 29, 2016 at 1900 hours (Ground 1, Ground 2, MET 1 High, and MET 1 Low), and the remainder on April 30, 2016 at 1900 hours (Ground 3, MET 2 High, MET 2 Low, MET 3 High, MET 3 Low, MET 4 High, and MET 4 Low). Equipment status checks were performed on May 15. During this visit the CF cards and HAZE batteries were exchanged for empty cards and charged batteries. Data was retrieved from the cards and stored for interpretation at a future date. Detectors MET 4 High and MET 4 Low were removed on June 6. Ground 1, Ground 2, Ground 3, MET 2 Low and MET 2 High were removed on June 7, and MET 1 High, MET 1 Low, MET 3 High and MET 3 Low were removed on June 9.

Detectors Ground 1, Ground 2, Ground 3, MET 1 Low, MET 1 High, Met 2 High, MET 3 Low, MET 3 High, and Met 4 High were in operation for the entire monitoring period and complete datasets were collected. Two detectors malfunctioned during the spring 2016 monitoring period, accounting for approximately 6% of the total dataset. Malfunctions are summarized below and in Appendix A:

- MET 2 Low did not collect data for 13 nights from May 3 to 15, due to water leakage damaging the HAZE batteries
- MET 3 Low did not collect data for 6 nights from May 10 to 15 due to water leakage damaging the HAZE batteries

Though these two malfunctions resulted in reduced sample size at two locations, with 11 stations ample data were collected for the Project area despite the malfunctions.

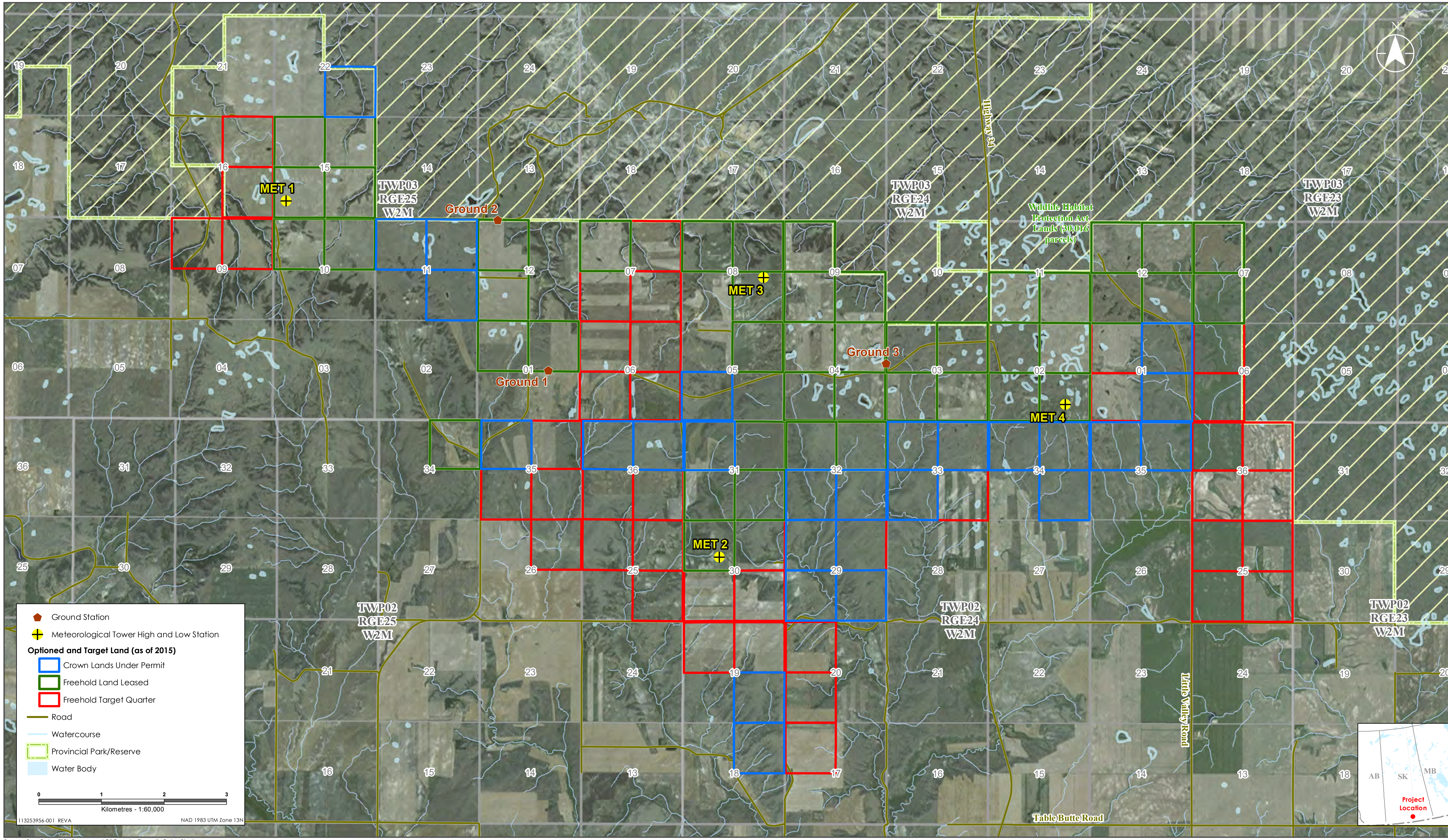
Fall 2016

All seven stations (eleven detectors) began collecting data on July 28, 2016 at 1900 hours. Equipment status checks were performed on August 18 and August 31. During these visits the CF cards and HAZE batteries were exchanged for empty cards and charged batteries. Data was retrieved from the cards and stored for interpretation at a future date. All detectors were removed on September 13, 2016.

Detectors Ground 1, Ground 2, Ground 3, MET 1 Low, MET 2 Low, and Met 3 Low were in operation for the entire monitoring period and complete datasets were collected. Five detectors malfunctioned during the fall 2015 monitoring period, accounting for approximately 16% of the total dataset. Malfunctions are summarized below and in Appendix A:

- MET 1 High did not collect data for 23 nights from August 7 to 17, August 23 to 30 and September 10 to 13 due to lighting strikes.
- MET 2 High did not collect data for 19 nights from August 7 to 17 and August 23 to 30 due to lighting strikes.
- MET 3 High did not collect data for 14 nights from August 8 to 17 and September 10 to 13 due to lighting strikes.
- MET 4 Low did not collect data for 8 nights from August 8 to 17 due to card malfunctions.
- MET 4 High did not collect data for 20 nights, from August 7 to 17 and September 5 to 13 due to power failure, possibly due to lightning strikes.

Some data malfunctions occurred during peak activity periods, particularly for the four high detectors. However, activity is relatively constant during the peak migration period, so using the average of the data from that period, regardless of the gaps due to malfunctions, will be representative of the activity levels.



Sources: Base Data - ESRI; Government Of Canada; Thematic Data - Stantec

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Disclaimer: This map is for illustrative purposes to support this Stantec project; questions can be directed to the issuing agency.

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Bat Acoustic Monitoring Station Locations

Figure 2-1

2.3 ANALYSIS

2.3.1 Bat Echolocation Analysis

The unit of measure selected for analysis is a bat call sequence, which is expressed as a bat pass and can be used as a relative measure of bat activity. Bat passes per detector night is used as the relative measure of bat activity and is the primary measurement for reporting activity rates. A limitation to using bat passes as a metric is that it is unknown if multiple passes are attributed to one or several active bats in the area (i.e., one individual making multiple passes near the detector). However, standard practice is to use ≥ 2 seconds between call sequences to define a bat pass (Loeb et al. 2015). Echolocation analysis to determine the number of bat passes and identify passes to species was conducted using AnalookW (version 4.1 t). Data were compiled using Microsoft Excel and outputs modeled using R (version 3.2.2). Site-specific data for sunrise and sunset were generated using Anasun (version 1.0a). Bat calls and passes were visually distinguished using reference data from:

- Acoustics Workshop: Analysis of AnaBat files (Cori Lausen 2008, pers. comm.)
- Acoustics Techniques Course: Reference Bat Calls (Cori Lausen 2011, pers. comm.)
- Published literature
- Stantec bat call identification key

While automatic bat identification algorithms (e.g. Kaleidoscope Pro) exist and, in some cases, provide a more precise identification than manual identification, previous experience has indicated that these types of software do not completely analyze an entire dataset, and have a tendency to not recognize low quality calls and duplicate bat passes. Manual identification using AnalookW was therefore used to ensure a complete analysis of the dataset.

Where possible bats were identified to species, or grouping based on several parameters: frequency (minimum), duration, slope, and shape. Considerable regional variation can occur with the calls of a species based on habitat and other bat species in the area (Cori Lausen, 2008, pers. comm.); therefore, parameters from western Canada records were relied upon more heavily.

Though detector setup methods such as microphone orientation and sensitivity reduce extraneous noise collected (see Section 2.1), large quantities of unwanted noise data can be collected by the detectors. Due to similarities between species echolocation parameters and/or degraded call quality from extraneous noise, some bats cannot be conclusively identified to species and were therefore grouped together. Due to the potential for call similarities, there is some uncertainty in differentiating calls of big brown and silver-haired bats, eastern red and little brown myotis, and bat species in the *Myotis* genus. In most cases, these groupings were not identified to species conclusively.

Considering the bat species in Saskatchewan (see Section 3.1) and the inability to identify all bat passes to species due to call quality and overlapping call parameters between species, the following five groupings were used for species classification in this study when individual species classification was not possible:

- **Low frequency bat**: includes big brown bat (*Eptesicus fuscus*), silver-haired bat (*Lasionycteris noctivagans*) and hoary bat (*Lasiurus cinereus*)
- **High frequency bat**: includes eastern red bat (*Lasiurus borealis*), long-eared bat (*Myotis evotis*), little brown myotis (*Myotis lucifugus*) and western small-footed bat (*Myotis ciliolabrum*)
- **Big brown bat or silver-haired bat**
- **Eastern red bat or little brown myotis**
- ***Myotis* species**: includes long-eared bat, little brown myotis, and western small-footed bat

Based on comparisons of echolocation results and fatality search results at a number of wind development projects in southern Alberta by Baerwald et al. (2008) and Baerwald and Barclay (2009), bat passes identified into the big brown/silver-haired grouping are likely to be mainly silver-haired bats. Likewise, the low frequency bat grouping is expected to be predominantly silver-haired and hoary bats.

The majority of bat fatalities at wind energy development sites in North America involve migratory species (Arnett and Baerwald 2013, Zimmerling and Francis 2016); therefore, migratory bats were considered as an additional grouping for this assessment. Three bat species known to occur within the Project area are considered migratory: hoary, eastern red and silver-haired bats. As such, the migratory bat grouping includes the three migratory bat species and all individuals within the low frequency bat, big brown/silver-haired bat, and eastern red/little brown myotis groupings. Grouping migratory bats in this manner provides the most conservative estimate of the maximum potential migratory bat activity within the Project area.

3.0 RESULTS AND DISCUSSION

3.1 BAT SPECIES IN THE PROJECT AREA

Eight species of bat are known to occur in Saskatchewan, seven of which have the potential to occur within the Project area (Table 3-1). The distribution data for Saskatchewan's bats indicate that the northern myotis, a non-migratory species of bat, is not expected to occur in the Project area (Caceres and Barclay 2000, BCI 2012). All seven of the possible bat species may potentially breed within the Project area as suitable terrain and vegetation is present.

All seven bat species potentially occurring in the Project area were identified by call, and therefore confirmed as occurring in the Project area. Species identified using manual identification are: eastern red bat, hoary bat, silver-haired bat, little brown myotis, long-eared myotis, western small footed myotis. Big brown bat was confirmed during the fall 2015 analysis.

Little brown myotis are the most abundant and widespread bat species in North America (COSEWIC 2013) and likely make up the majority of the Myotis species grouping observations. While little brown myotis are currently abundant in Saskatchewan, the species is listed as Endangered under the *SARA* (ECCC 2016) due to white-nose syndrome, which is currently decimating populations in eastern North American.

Table 3-1 Bat Species With Potential to Occur in the Project Area

Common Name	Scientific Name	*SRank[1]	Widlife Act[2]	COSEWIC Status[3]	SARA Status[4]	Expected to Breed in the Project area	Migratory Bat
Big brown bat	*Eptesicus fuscus*	**S5**	N/A	N/A	N/A	Yes (roosts in buildings, tree cavities, rock crevices)	No
Silver-haired bat	*Lasionycteris noctivagans*	**S5B**	N/A	N/A	N/A	Yes (roosts in foliage)	Yes
Eastern red bat	*Lasiurus borealis*	**S4B**	N/A	N/A	N/A	Yes (roosts in foliage)	Yes
Hoary bat	*Lasiurus cinereus*	**S5B**	N/A	N/A	N/A	Yes (roosts in tree cavities)	Yes
Western small-footed bat	*Myotis ciliolabrum*	**S2S3**	N/A	N/A	N/A	Yes (roosts in rock crevices; associated with badlands along river valleys)	No
Little brown myotis	*Myotis lucifugus*	**S4**	N/A	Endangered	Endangered (Schedule1)	Yes (roosts in buildings, tree cavities, rock crevices)	No
Long-eared bat	*Myotis evotis*	**S2**	N/A	N/A	N/A	Yes (roosts in buildings, tree cavities, rock crevices)	No

SOURCES:
[1] NatureServe (2012), [2]MOE (2016), [3] COSEWIC (2016), [4] ECCC (2016)
S Rank Identifies subnational conservation rank (for Saskatchewan): S1: critically imperiled, S2: imperiled, S3: vulnerable, S4: Apparently Secure; S5: Secure; 2 ranks (S2S3) indicates a possible range of status; B refers to the Saskatchewan breeding population only.

3.2 BAT ACTIVITY LEVELS

Although this study uses Alberta's guidelines (AEP 2016), which states that pre-construction migratory bat activity is positively correlated to post-construction mortality rates, the American Wind Wildlife Institute reports that the ability to predict collision risk for birds and bats from activity recorded by radar and acoustic detectors, respectively, remains elusive (AWWI 2015). To date studies have not been able to develop a quantitative model enabling reasonably accurate prediction of collision risk from pre-construction acoustic surveys (e.g., Hein et al. 2013).

3.2.1 Monitoring Summary

Fall 2015

During the 2015 fall monitoring period, migratory bat activity rates for all detectors during the full monitoring period (July 14 – September 30) ranged from 0.8 to 5.2 migratory bat passes per detector night, with an average of 2.4 migratory bat passes per detector night. During this same monitoring period, total bat activity rates for all bats in the Project area from all detectors combined ranged from 0.8 to 12.7 bat passes per detector night, with an average of 6.1 bat passes per detector night (Table 2-1).

During the Alberta Guideline period the migratory bat activity rate was recorded as 2.0 passes per detector night at elevated detectors, while non-migratory bats was only 0.3 (Table 2-1). Generally, non-migratory bat species showed higher activity at low detectors compared to migratory bat species, which is consistent with known foraging behavior of these species.

Although there was higher total bat activity recorded at the low detectors, the higher proportion of migratory bat activity at the high detectors (Figure 3-1) in the potential rotor-swept area supports observations that most bat fatalities at wind projects are migratory bats, as non-migratory bats are more active at lower altitude (Arnett et al. 2008), as observed for this Project.

Overall, Ground 2 recorded the highest levels of both total and migratory bat activity in the Project area (Figure 3-1), with 18.0 total bat and 6.6 migratory bat passes per detector night during the Alberta Guideline Period (August 1 – September 10) and 12.7 total bat and 5.2 migratory bat passes per detector night during the full monitoring period. This was likely due to the proximity to the adjacent forested coulees (Figure 2-1). In comparison, MET 2 High had the lowest levels of both total and migratory bat activity, both being 1.2 passes per detector night (total and migratory) for the Alberta Guideline period, and 0.8 passes per detector night (total and migratory) for the full monitoring period (Figure 3-1). Migratory bat activity peaked on several nights between July 28 and August 28, 2015, for all detectors combined. The highest level of activity was observed on the night of August 21 with 13.3 migratory bat passes per detector night (Figure 3-1, Appendix B). Total bat activity was also highest on the night of August 21 with 19.7 bat passes per detector night (Figure 3-1, Appendix B).

Table 3-2 Summary of Bat Activity at Each Monitoring Station During the Fall 2015 Monitoring Period

	Ground 1	Ground 2[1]	Ground 3	MET 1 Low	MET 1 High	MET 2 Low	MET 2 High	MET 3 Low	MET 3 High	MET 4 Low	MET 4 High	Total
Number of Detectors	1	1	1	1	1	1	1	1	1	1	1	11
Detector Height Above Ground (m)	2	2	2	2	45	2	47	2	49	2	49	N/A
Number of Nights of Operation	64	79	79	79	56	65	67	78	75	78	78	798
Alberta Guideline Period Nights of Operation Aug 1 to Sep 10	31	41	41	41	26	32	31	41	41	41	41	407
Number of Detector Hours	768	948	948	672	948	804	780	900	936	936	936	9,576
Number of Raw Data Files	8,566	5,026	1,615	3,225	5,566	55,745	3,114	32,541	16,613	17,690	2,112	151,813
Number of Recorded Total Bat Passes	585	1,003	646	486	137	321	56	571	222	686	116	4,829
Number of Recorded Migratory Bat Passes	235	413	185	120	115	154	55	199	203	194	81	1,954
Alberta Guideline Period Number of Recorded Total Bat Passes (Aug 1 to Sep 10)	384	736	511	358	82	248	38	313	170	526	96	3,462
Alberta Guideline Period Number of Recorded Migratory Bat Passes (Aug 1 to Sep 10)	184	270	123	66	81	122	37	156	97	143	67	1,346
Alberta Guideline Period Migratory Bat Passes Per Detector Night (Aug 1 to Sep 10)	5.9	6.6	3.0	1.6	3.1	3.8	1.2	3.8	2.4	3.5	1.6	3.3 2.0[2]
Alberta Guideline Period Total Bat Passes Per Detector Night (Aug 1 to Sep 10)	12.4	18.0	12.5	8.7	3.2	7.8	1.2	7.6	4.1	12.8	2.3	8.5
Migratory Bat Passes Per Detector Night	3.7	5.2	2.3	1.5	2.1	2.4	0.8	2.6	2.7	2.5	1.0	2.4 1.6[2]
Total Bat Passes Per Detector Night	9.1	12.7	8.2	6.2	2.4	4.9	0.8	7.3	3.0	8.8	1.5	6.1

NOTES:

1- Detector Ground 2 was relocated during the 2016 surveys (Figure 2-1)

2- Average based on high detectors

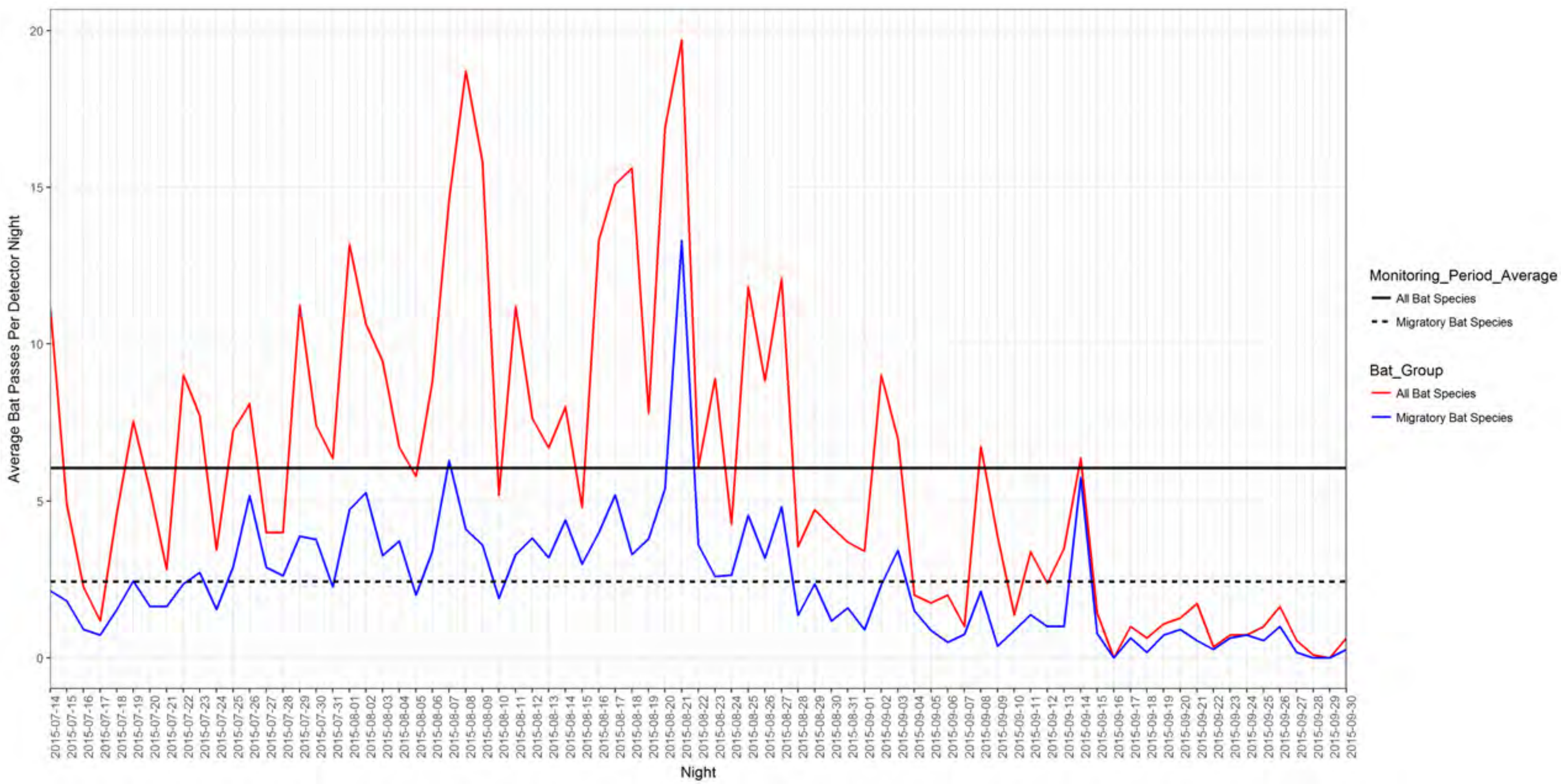

Figure 3-1 Bat Passes per Detector Night (Migratory and Total) During the 2015 Fall Monitoring Period

Spring 2016

During the 2016 spring monitoring period, migratory bat activity rates for all detectors ranged from 0.1 to 0.7 migratory bat passes per detector night, with an average of 0.3 migratory bat passes per detector night. Total bat activity in the spring ranged from 0.1 to 6.5 bat passes per detector night, with an average of 1.4 bat passes per detector night (Table 3-3). Generally, non-migratory bat species showed higher activity at low detectors (1.8 passes per detector night) compared to elevated detectors where a rate of 0.01 passes per detector night was recorded.

Overall, MET 3 Low recorded the highest levels of both total and migratory bat activity in the Project area (Figure 3-2), with 6.5 total bat and 0.7 migratory bat passes per detector night observed during the 2016 Spring monitoring period. This is possibly due to its proximity to treed coulees.

Migratory bat activity peaked on several nights over the spring monitoring period with the highest level of activity observed on the night of June 4 with 1.2 migratory bat passes per detector night (Figure 3-2,Appendix A). Total bat activity was also highest on the night of June 4 with 4.5 bat passes per detector night (Figure 3-2,Appendix A).

Table 3-3 Summary of Bat Activity at Each Monitoring Station During the Spring 2016 Monitoring Period

	Ground 1	Ground 2[1]	Ground 3	MET 1 Low	MET 1 High	MET 2 Low	MET 2 High	MET 3 Low	MET 3 High	MET 4 Low	MET 4 High	Total
Number of Detectors	1	1	1	1	1	1	1	1	1	1	1	11
Detector Height Above Ground (m)	2	2	2	2	45	2	47	2	49	2	49	N/A
Number of Nights of Operation	39	39	38	40	40	25	38	33	39	37	37	405
Number of Detector Hours	468	468	456	480	480	300	456	396	468	444	444	4,860
Number of Raw Data Files	771	2525	3887	6780	4608	3442	2635	1968	6504	12320	5798	51,238
Number of Recorded Total Bat Passes	34	9	91	73	10	8	3	213	13	109	4	567
Number of Recorded Migratory Bat Passes	17	7	11	16	8	5	3	24	13	9	4	117
Migratory Bat Passes Per Detector Night	0.4	0.2	0.3	0.4	0.2	0.2	0.1	0.7	0.3	0.2	0.1	0.3 0.2[2]
Total Bat Passes Per Detector Night	0.9	0.2	2.4	1.8	0.2	0.3	0.1	6.5	0.3	2.9	0.1	1.4

NOTES:
1- Detector Ground 2 was relocated during the 2016 surveys (Figure 2-1)
2- Average based on high detectors

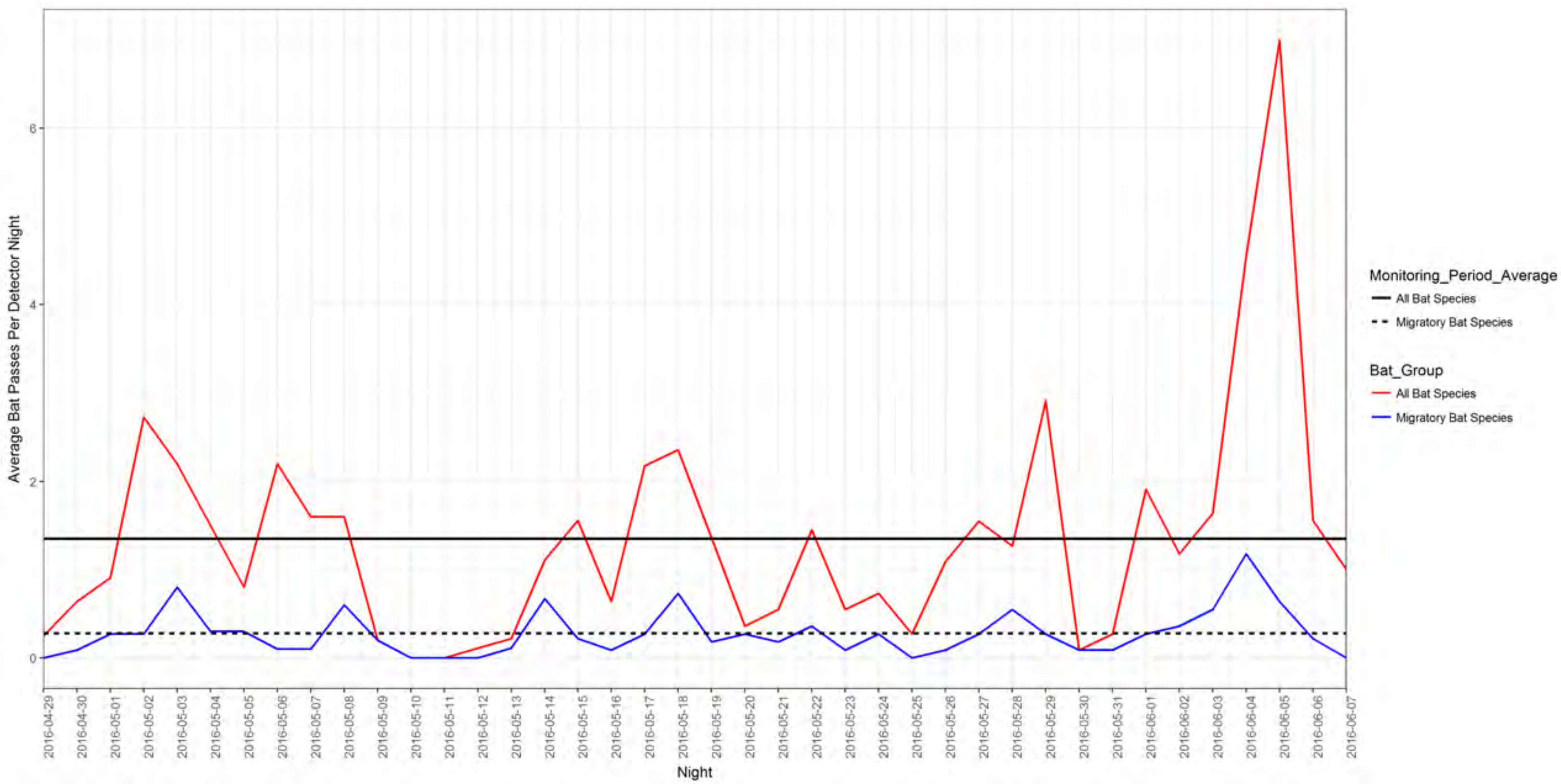

Figure 3-2 Bat Passes per Detector Night (Migratory and Total) During the 2016 Spring Monitoring Period

Fall 2016

During the 2016 fall monitoring period, migratory bat activity rates for all detectors during the full monitoring period (July 28 – September 1) ranged from 1.1 to 3.8 migratory bat passes per detector night, with an average of 3.0 migratory bat passes per detector night. Total bat activity rates for fall 2016 ranged from 1.1 to 18.9 bat passes per detector night, with an average of 7.5 bat passes per detector night (Table 3-4).

During the Alberta Guideline period the migratory bat activity rate was recorded as 2.4 passes per detector night at elevated detectors, while non-migratory bats had rates of 0.5 passes per detector night (Table 3-4, Figure 3-3). Generally, non-migratory bat species had activity rates 18x higher at low detectors compared to elevated detectors, which is consistent with known foraging behavior of these species.

Although there was higher total bat activity recorded at the low detectors, there was a higher proportion of migratory bat activity at the high detectors (Figure 3-3) in the potential rotor-swept area, which supports observations that most bat fatalities at wind projects are migratory bats, as non-migratory bats are more active at lower altitude (Arnett et al. 2008).

Table 3-4 Summary of Bat Activity at Each Monitoring Station During the Fall 2016 Monitoring Period

	Ground 1	Ground 2[1]	Ground 3	MET 1 Low	MET 1 High	MET 2 Low	MET 2 High	MET 3 Low	MET 3 High	MET 4 Low	MET 4 High	Total
Number of Detectors	1	1	1	1	1	1	1	1	1	1	1	11
Detector Height Above Ground (m)	2	2	2	2	45	2	47	2	49	2	49	N/A
Number of Nights of Operation	48	48	48	48	25	48	29	48	34	40	28	444
Alberta Guideline Period Nights of Operation Aug 1 to Sep 10	43	43	43	43	22	43	24	43	31	35	25	395
Number of Detector Hours	576	576	576	576	300	576	348	576	408	480	336	5,328
Number of Raw Data Files	5,939	7,534	3,652	79,248	5,332	5,491	3,947	7,404	8,176	83,027	321	210,071
Number of Recorded Total Bat Passes	376	156	360	905	94	223	33	568	148	409	64	3,336
Number of Recorded Migratory Bat Passes	174	103	129	156	66	129	31	241	128	116	51	1,324
Alberta Guideline Period Number of Recorded Total Bat Passes (Aug 1 to Sep 10)	312	138	229	817	78	205	28	489	128	341	58	2,823
Alberta Guideline Period Number of Recorded Migratory Bat Passes (Aug 1 to Sep 10)	151	89	102	138	57	120	26	211	113	98	46	1,151
Alberta Guideline Period Migratory Bat Passes Per Detector Night (Aug 1 to Sep 10)	3.5	2.1	2.4	3.2	2.6	2.8	1.1	4.9	3.6	2.8	1.8	2.9 2.4[2]
Alberta Guideline Period Total Bat Passes Per Detector Night (Aug 1 to Sep 10)	7.3	3.2	5.3	19	3.5	4.8	1.2	11.4	4.1	9.7	2.3	7.1
Migratory Bat Passes Per Detector Night	3.6	2.1	2.7	3.2	2.6	2.7	1.1	5	3.8	2.9	1.8	3.0 2.4[2]
Total Bat Passes Per Detector Night	7.8	3.2	7.5	18.9	3.8	4.6	1.1	11.8	4.4	10.2	2.3	7.5

NOTES:
1- Detector Ground 2 was relocated during the 2016 surveys (Figure 2-1)
2- 2-Average based on high detectors

Figure 3-3 Bat Passes per Detector Night (Migratory and Total) During the 2016 Fall Monitoring Period

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3.2.2 Nightly Bat Activity Levels

Fall 2015

The highest levels of bat activity were recorded between 0300 and 0359 hours, with a total of 644 bat passes recorded, though bat activity was relatively even over the evenings between 2100 and 0459 hours (Figure 3-4). Both migratory and non-migratory activity was also relatively consistent between 2100 and 0459 hours (Figure 3-4).

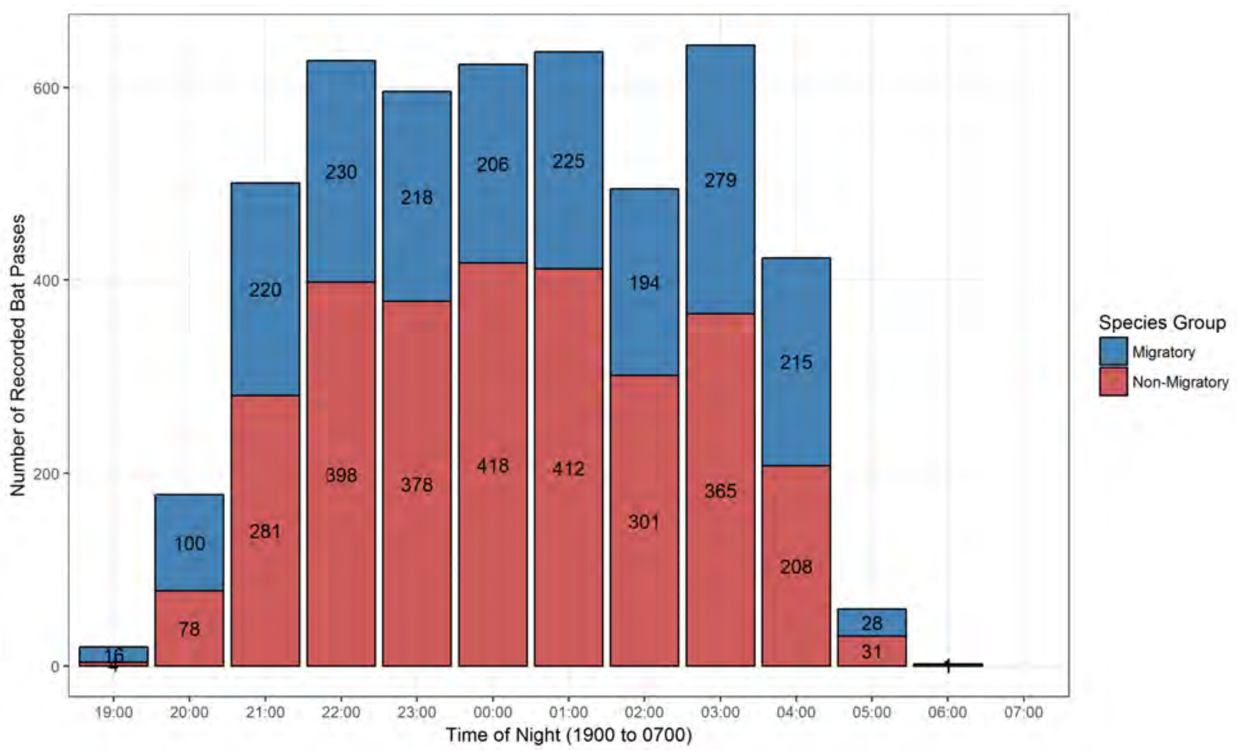

Figure 3-4 Distribution of Hourly Bat Activity for Migratory and Non-migratory Bats During the Fall 2015 Monitoring Period

Spring 2016

The highest levels of bat activity were recorded between 2200 and 2259 hours, with a total of 126 bat passes recorded. Most activity occurred between 2100 and 0359 hours (Figure 3-5).

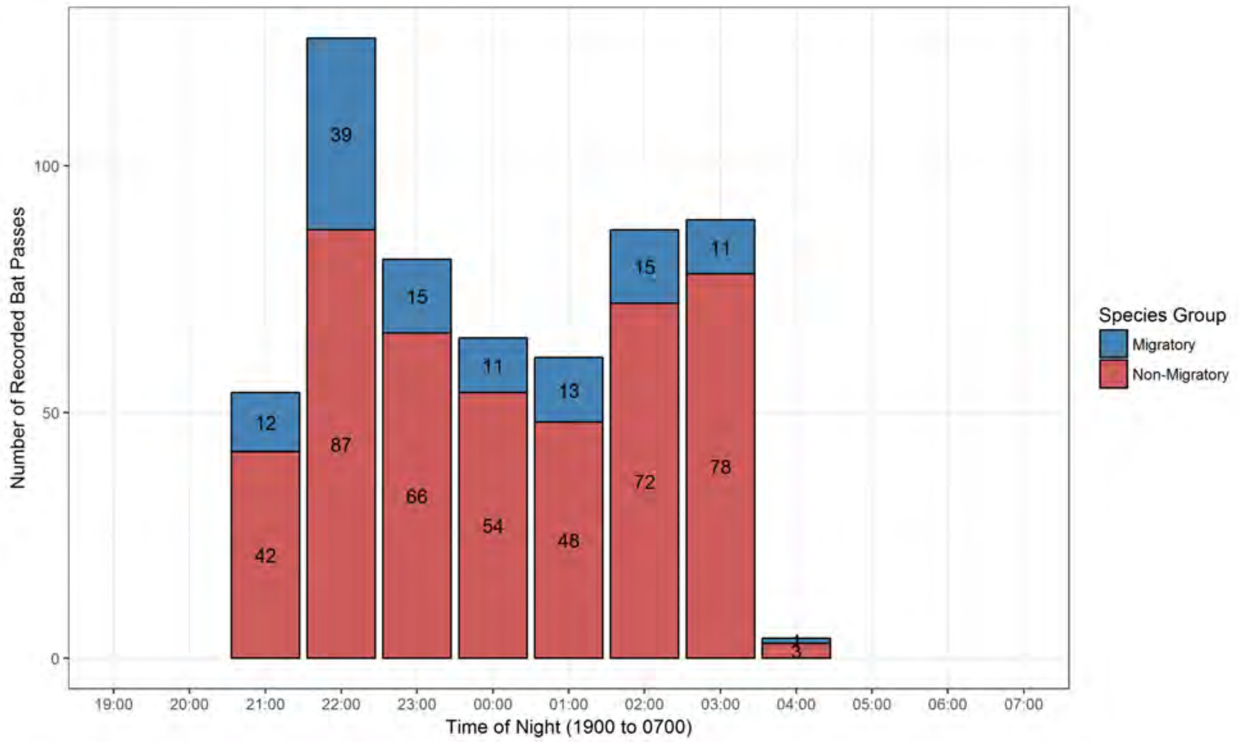

Figure 3-5 Distribution of Hourly Bat Activity for Migratory and Non-migratory Bats During the Spring 2016 Monitoring Period

Fall 2016

The highest levels of bat activity were recorded between 2200 and 2259 hours, with a total of 455 bat passes recorded, though bat activity was relatively even over the nights between 2100 and 0459 hours (Figure 3-6). Both migratory and non-migratory activity was also relatively consistent between 2100 and 0459 hours (Figure 3-6).

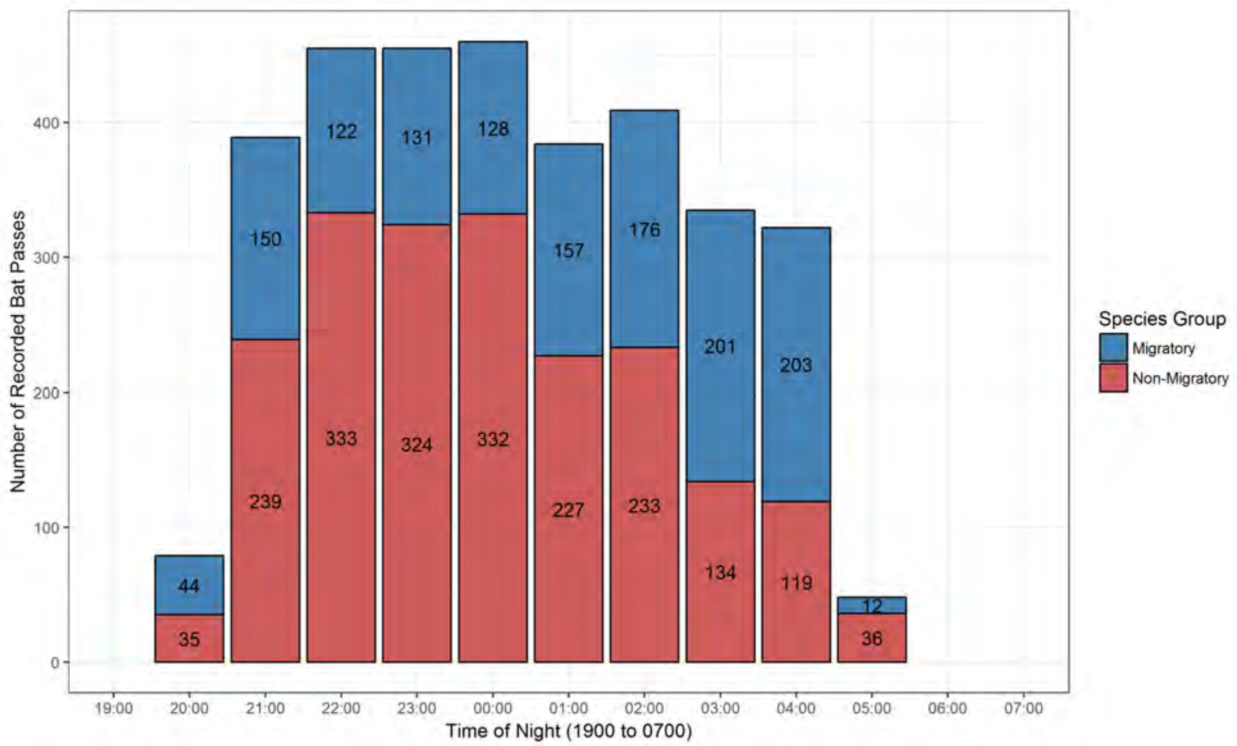

Figure 3-6 Distribution of Hourly Bat Activity for Migratory and Non-migratory Bats During the Fall 2016 Monitoring Period

3.2.3 Annual Fall Bat Activity

Between the 2015 and 2016 fall monitoring period, bat activity was relatively similar. During the Alberta Guideline Period, the average migratory bat activity at the high detectors was 2.0 passes per detector night in 2015 and 2.4 passes per detector night in 2016. The differences in activity rates between the two years of fall monitoring likely represents potential year-to-year variation in activity rates.

The three migratory species recorded in the Project area, eastern red bat, hoary bat, and silver-haired bat displayed similar patterns of activity between the two years of fall monitoring (Appendix B). Eastern red bat peak activity occurred on August 1 in 2015 and July 30 in 2016. Hoary bat activity peaked on August 6 in 2015 and August 4 in 2016. Bats identified as silver-haired bats were infrequently recorded over the fall monitoring periods, as this species is difficult to differentiate from the big brown bat. The big brown / silver-haired bat species grouping is likely mostly made up of silver-haired bats (Baerwald et al. 2008, Baerwald and Barclay 2009) and was the mostly commonly reported migratory species / grouping during both years of fall monitoring. Big brown / silver-haired bat activity was highest on August 21 in 2015 and August 31 in 2016, but also peaked on August 22. Consistent annual pattern of fall activity reflects those of migratory species that are spending the summer north of the Project area and only passing through on migration, as their activity is regulated more by seasonality and less by weather conditions.

3.3 ENVIRONMENTAL FACTORS

3.3.1 Sunrise and Sunset

Between the first (July 14) and last (September 30) night of monitoring in fall 2015, sunset and sunrise times varied by 4 hours and 8 minutes with a maximum darkness period of 12 hours and 16 minutes. Between the first and last night of monitoring in spring 2016, sunset and sunrise times varied by 1 hour and 34 minutes, with a maximum darkness period of 9 hours and 27 minutes. Between the first (July 28) and last (September 13) night of monitoring in fall 2016, sunset and sunrise times varied by 2 hours and 34 minutes with a maximum darkness period of 11 hours and 17 minutes. Because of this variation, it is not possible to accurately display nightly data in relation to both sunset and sunrise simultaneously. As such, nightly activity for the Project area is most effectively displayed in reference to the beginning of darkness (i.e., sunset), and the sunrise period accounts for the entire variation in the number of hours of darkness between the start and end of the monitoring period. No bat passes were recorded prior to sunset and activity rates increased considerably one hour after sunset (Figure 3-7, Figure 3-8, and Figure 3-9). Nightly activity varied by detector and by monitoring period (Figure 3-7, Figure 3-8, and Figure 3-9).

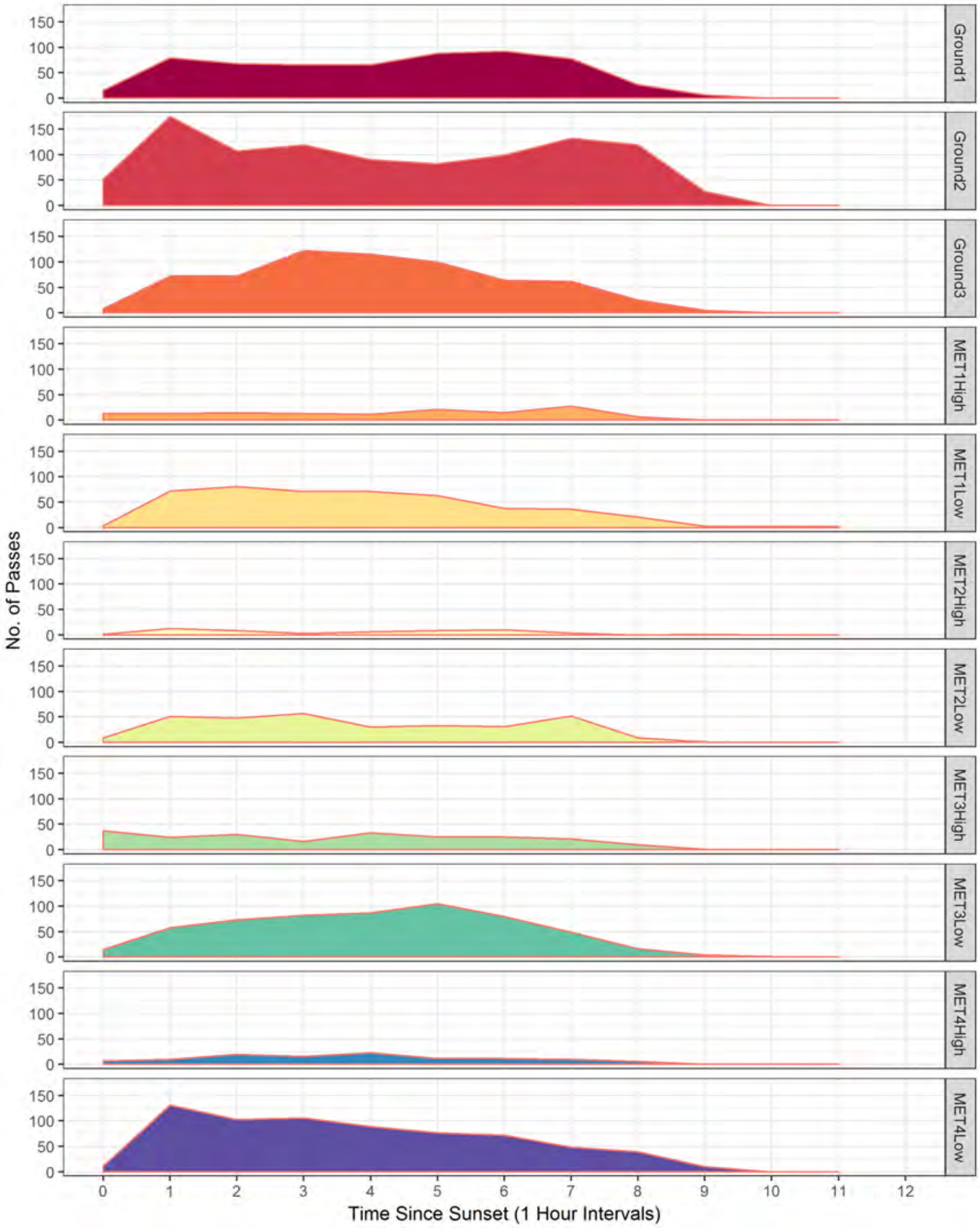

Figure 3-7 Distribution of Nightly Bat Activity by Detector During the Fall 2015 Monitoring Period

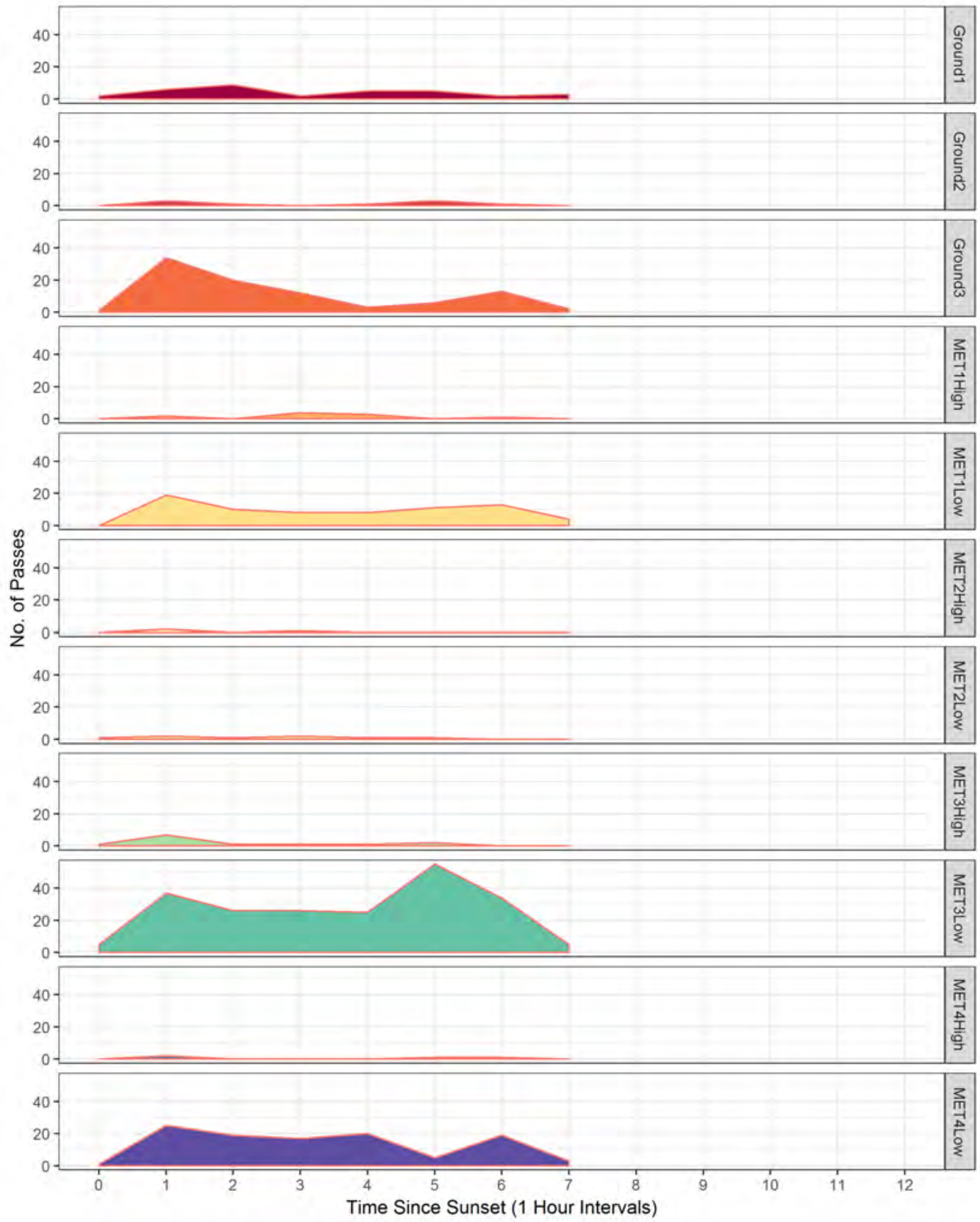

Figure 3-8 Distribution of Nightly Bat Activity by Detector During the Spring 2016 Monitoring Period

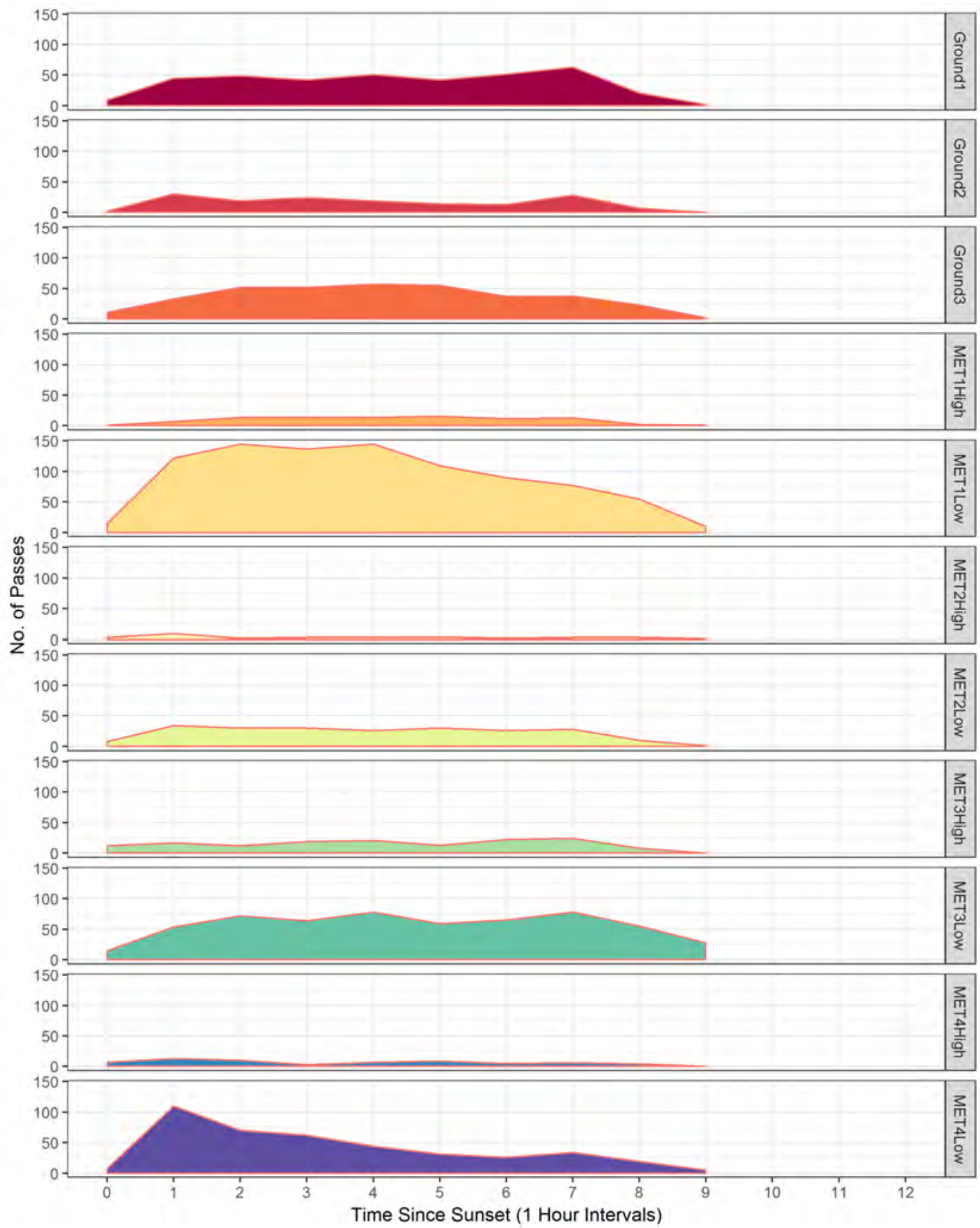

Figure 3-9 Distribution of Nightly Bat Activity by Detector During the Fall 2016 Monitoring Period

3.4 BAT ACTIVITY BY SPECIES OR SPECIES GROUPING

The number of passes for each bat species and bat grouping recorded during the monitoring period is provided in Appendix B. The most common species or species grouping in the Project area during all three monitoring periods was *Myotis* species, followed by the big brown/silver-haired grouping (Figures 3-10, 3-11 and 3-12). In general, *Myotis* species activity was more variable throughout the three monitoring periods, with no consistent pattern.

The most common migratory species or species grouping was the big brown/silver-haired bat species grouping. During the spring monitoring period, bat observations were relatively sparse with the highest periods of activity recorded during the nights of June 3, 4 and 5, with relatively consistent activity occurring from early May to Early June.

During the fall monitoring period in 2015, big brown/silver-haired bat began increasing from the beginning of the monitoring period on July 14, peaking on August 21, and decreasing to very little activity by mid-September. During the fall monitoring period in 2016, big brown/silver-haired bat activity peaked on July 29 and 30, and was relatively low until mid-August, peaking on August 31, and decreasing until the end of the monitoring period (September 12) (Appendix B).

Other migratory bat species and species groupings, including silver-haired bat, eastern red bat, hoary bat and low frequency bats displayed similar patterns of activity to the big brown / silver-haired bat species grouping during both the spring and fall monitoring periods.

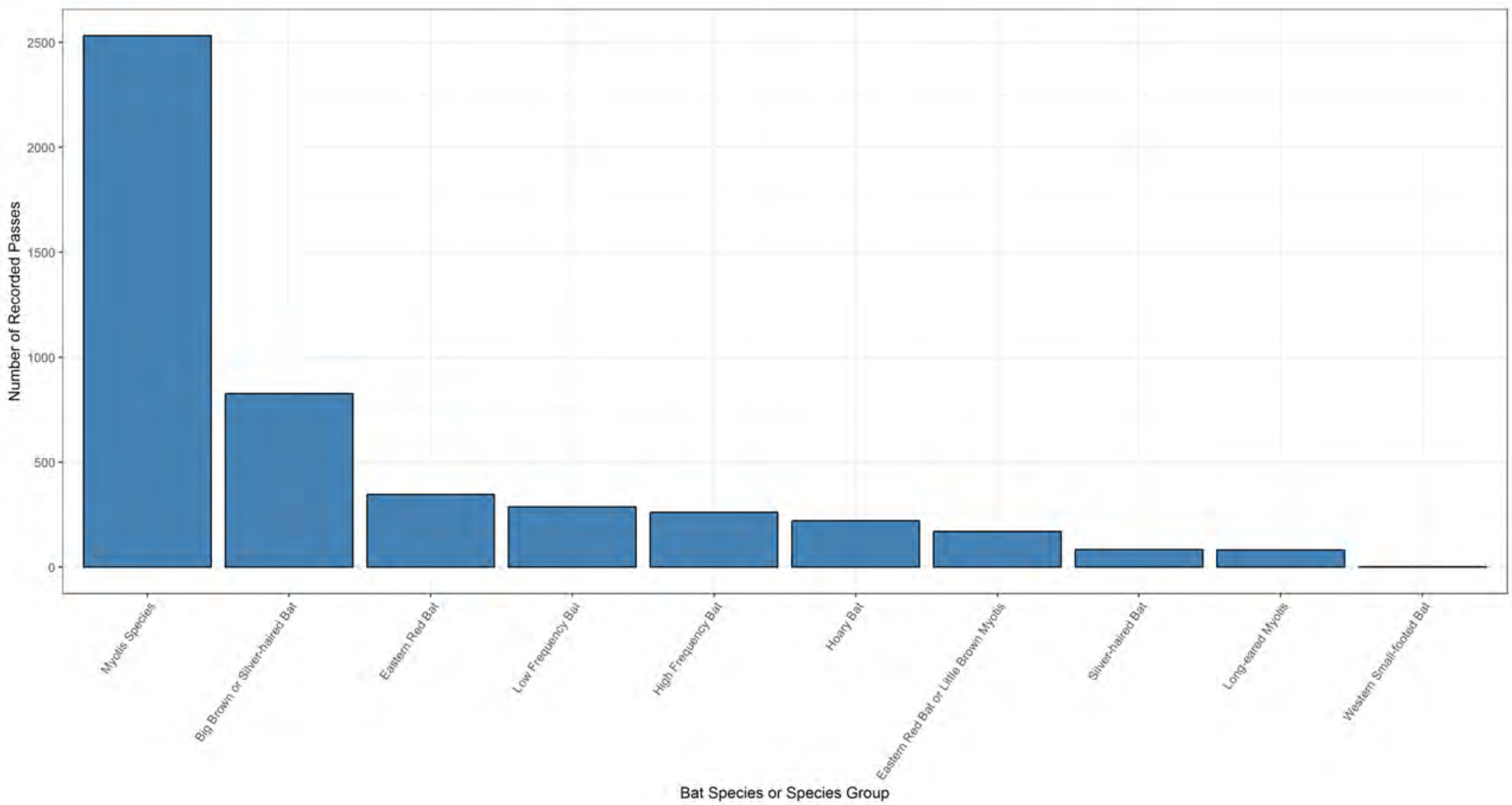

Figure 3-10 Total Bat Passes per Species or Species Grouping During the Fall 2015 Monitoring Period

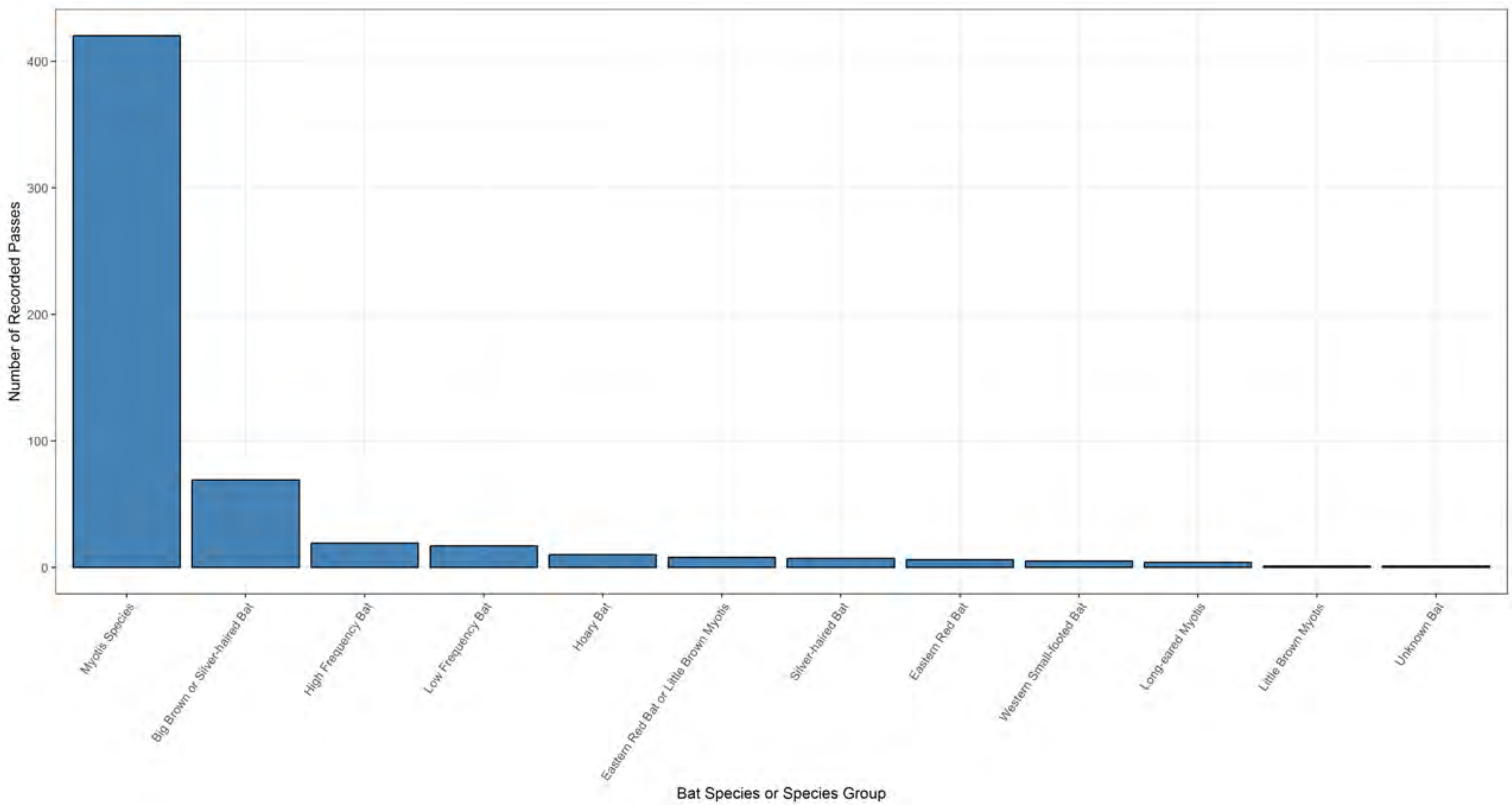

Figure 3-11 Total Bat Passes per Species or Species Grouping During the Spring 2016 Monitoring Period

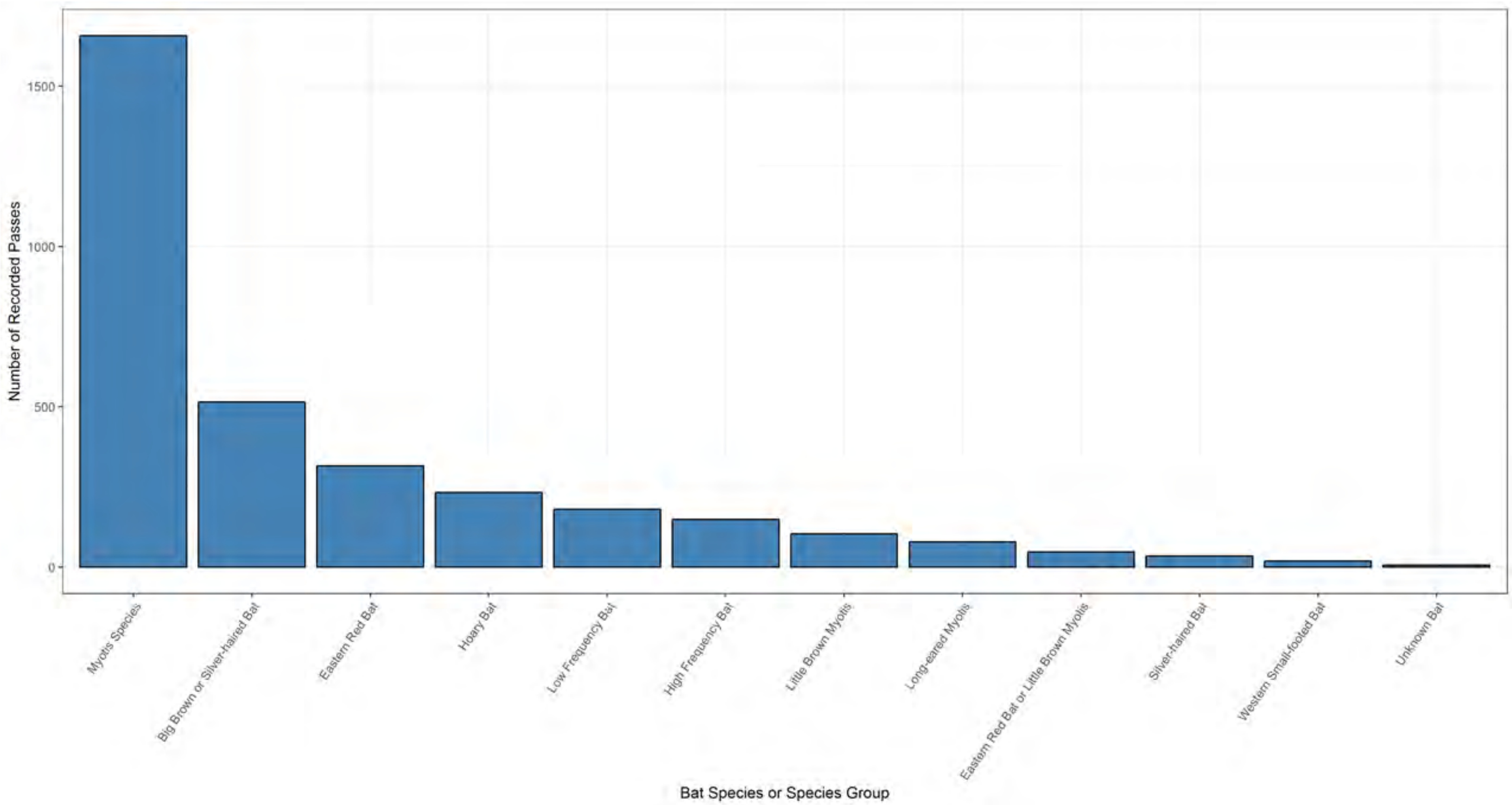

Figure 3-12 Total Bat Passes per Species or Species Grouping During the Fall 2016 Monitoring Period

4.0 SUMMARY

The average activity rate for migratory bats at high detectors during the Alberta Guideline period (August 1 to September 10) was 2.0 migratory bat passes per detector night in 2015 and 2.4 migratory bat passes per detector night in 2016. Based on the AEP guidance related to bat activity and wind developments (ESRD 2013), greater than two migratory bat passes per detector night during this period indicates that there is a potentially high risk of bat fatalities for an area. Although this study is using Alberta's guidelines (ESRD 2013), which states that pre-construction bat activity is correlated to post-construction mortality rates, the ability to predict collision risk for birds and bats from activity recorded by radar and acoustic detectors, respectively, remains elusive as the correlations between activity rates and fatality rates are not strong (AWWI 2015). To date studies have not been able to develop a quantitative model enabling reasonably accurate prediction of collision risk from these surveys (e.g., Hein et al. 2013). Key findings of the passive acoustic bat surveys include:

- 6.1 total and 2.4 migratory bat passes per detector night were recorded over the fall 2015 monitoring period (July 14 to September 30) for all detectors.
- 1.4 total and 0.3 migratory bat passes per detector night were recorded over the spring 2016 monitoring period (April 29 to June 6) for all detectors.
- 7.5 total and 3.0 migratory bat passes per detector night were recorded over the fall 2016 monitoring period (July 28 to September 13) for all detectors.
- During the Alberta Guideline monitoring period (August 1st to September 10th) activity rates for total bats and migratory bats were 8.5 and 2.4 in 2015 and 7.1 and 2.9 in 2016, respectively.
- A potential migratory corridor was identified following the Big Muddy Valley to the north of the Project Area; turbines are not sited within the Big Muddy Valley
- The most common species grouping of bats was the big/brown silver-haired bat species grouping.
- At the MET High detectors, the most recorded activity was that of migratory bat species.

Bat activity rates varied considerably between the spring and fall monitoring periods. There were approximately 5 times as many total bat passes per detector observed during the fall monitoring periods as during the spring monitoring period, and 8 to 11 times as many migratory bat passes per detector night. This is consistent with results of previous studies where the highest rates of bat mortality at wind projects in North America were consistently found during August and September (Arnett et al. 2008).

While non-migratory bats made up most recorded bat passes during all three monitoring periods, migratory bats consisted of 85, 93, and 81% of all high detector passes during the fall 2015, spring 2016 and fall 2016 monitoring periods respectively. The higher proportion of migratory bat activity at the high detector in the potential rotor-swept area for the Project supports observations that most bat fatalities at wind projects are migratory bats (94.4% in Alberta, 71.2 to 74% in Canada), as non-migratory bats are more active at lower altitude (BSC et al 2017, Zimmerling and Francis 2016). The potential for fatality of non-migratory bats is expected to be low as *Myotis* species tend to travel and forage below the rotor swept area (Arnett et al. 2008). Based on these results, the fatality risk for little brown myotis, which is listed on Schedule 1 (endangered) of the *SARA*, is predicted to be low.

5.0 CLOSURE

This report was prepared on behalf of BluEarth. The report may not be relied upon by any other person or entity without the express written consent of Stantec and BluEarth.

Any use which a third party makes of this report, or any reliance on decisions made based on it, is the responsibility of such third parties. Stantec accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The information and conclusions contained in this report are based upon work undertaken by trained professional and technical staff in accordance with accepted scientific practices current at the time the work was performed. The conclusions and recommendations presented represent the best judgment of Stantec based on the data obtained from the work and on the site conditions encountered at the time the work was performed at the specific sampling, testing, and/or observation locations.

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Appendix A BAT PASSES RECORDED IN THE OUTLAW TRAIL PROJECT STUDY AREA

Appendix A Bat Passes Recorded in the Outlaw trail Project Study Area

Table A- 1 Total Bat Passes Recorded in the Project Area During the Fall 2015 Monitoring Period

Night	Ground 1	Ground 2	Ground 3	Met 1 Low	Met 1 High	Met 2 Low	Met 2 High	Met 3 Low	Met 3 High	Met 4 Low	Met 4 High	Total Bat Passes Per Night	Number of Detector Nights	Bat Passes Per Detector Night (All Bats)
14-Jul-15	33	19	17	5	3	1	0	N/A	N/A	N/A	N/A	78	7	11.1
15-Jul-15	17	11	3	0	3	2	0	10	3	5	0	54	11	4.9
16-Jul-15	1	5	3	0	0	0	0	13	2	1	0	25	11	2.3
17-Jul-15	1	3	1	0	0	2	0	5	1	0	0	13	11	1.2
18-Jul-15	9	4	6	1	1	3	0	12	1	14	0	51	11	4.6
19-Jul-15	14	12	9	6	0	3	0	19	3	16	1	83	11	7.5
20-Jul-15	13	13	2	2	1	3	0	15	0	10	0	59	11	5.4
21-Jul-15	5	9	5	1	0	0	1	6	1	3	0	31	11	2.8
22-Jul-15	9	18	15	6	2	9	1	24	1	14	0	99	11	9
23-Jul-15	13	5	8	8	4	5	1	23	2	16	0	85	11	7.7
24-Jul-15	8	8	3	1	1	3	1	1	2	9	1	38	11	3.5
25-Jul-15	7	9	13	3	3	7	1	22	4	11	0	80	11	7.3
26-Jul-15	8	15	2	11	6	7	4	15	6	9	6	89	11	8.1
27-Jul-15	4	4	7	2	---	6	0	10	---	1	2	36	9	4
28-Jul-15	6	4	1	0	---	4	---	8	---	8	1	32	8	4
29-Jul-15	16	36	4	1	---	4	---	24	---	3	2	90	8	11.3
30-Jul-15	9	18	6	2	---	4	---	16	6	3	3	67	9	7.4
31-Jul-15	16	10	10	3	3	4	1	11	4	7	1	70	11	6.4
1-Aug-15	31	21	12	7	7	6	1	40	3	16	1	145	11	13.2

Appendix A Bat Passes Recorded in the Outlaw trail Project Study Area

Table A- 1 Total Bat Passes Recorded in the Project Area During the Fall 2015 Monitoring Period

Night	Ground 1	Ground 2	Ground 3	Met 1 Low	Met 1 High	Met 2 Low	Met 2 High	Met 3 Low	Met 3 High	Met 4 Low	Met 4 High	Total Bat Passes Per Night	Number of Detector Nights	Bat Passes Per Detector Night (All Bats)
2-Aug-15	19	4	11	12	1	5	5	40	8	10	2	117	11	10.6
3-Aug-15	12	30	22	1	3	8	1	11	2	12	2	104	11	9.5
4-Aug-15	9	50	2	1	0	3	2	1	0	5	1	74	11	6.7
5-Aug-15	7	7	21	2	---	7	1	0	4	6	3	58	10	5.8
6-Aug-15	14	7	21	4	---	2	1	16	3	20	0	88	10	8.8
7-Aug-15	20	15	15	7	---	4	4	24	8	43	6	146	10	14.6
8-Aug-15	19	26	66	11	---	7	2	36	11	9	0	187	10	18.7
9-Aug-15	10	13	88	7	---	6	3	13	6	9	3	158	10	15.8
10-Aug-15	5	11	6	0	---	5	6	8	0	9	2	52	10	5.2
11-Aug-15	17	11	32	6	---	9	4	8	0	22	3	112	10	11.2
12-Aug-15	11	10	3	11	7	10	0	13	5	14	0	84	11	7.6
13-Aug-15	11	11	5	1	4	7	---	5	5	16	2	67	10	6.7
14-Aug-15	23	19	6	4	6	5	---	7	4	3	3	80	10	8
15-Aug-15	7	9	0	4	1	8	---	3	7	5	4	48	10	4.8
16-Aug-15	9	27	12	17	6	12	---	11	4	31	4	133	10	13.3
17-Aug-15	18	23	23	19	4	9	---	11	11	24	9	151	10	15.1
18-Aug-15	14	29	22	24	6	7	---	12	3	36	3	156	10	15.6
19-Aug-15	10	15	7	7	8	5	---	6	7	11	2	78	10	7.8
20-Aug-15	15	89	16	9	1	10	---	2	8	15	4	169	10	16.9
21-Aug-15	18	33	10	18	18	36	---	2	18	26	18	197	10	19.7
22-Aug-15	17	8	5	4	2	6	---	6	1	12	0	61	10	6.1

Table A- 1 Total Bat Passes Recorded in the Project Area During the Fall 2015 Monitoring Period

Night	Ground 1	Ground 2	Ground 3	Met 1 Low	Met 1 High	Met 2 Low	Met 2 High	Met 3 Low	Met 3 High	Met 4 Low	Met 4 High	Total Bat Passes Per Night	Number of Detector Nights	Bat Passes Per Detector Night (All Bats)
23-Aug-15	8	33	12	8	1	1	0	5	8	10	3	89	11	8.1
24-Aug-15	5	2	6	2	3	9	0	2	4	12	2	47	11	4.3
25-Aug-15	13	47	12	13	5	11	0	4	2	21	2	130	11	11.8
26-Aug-15	4	42	10	5	2	6	0	2	10	16	0	97	11	8.8
27-Aug-15	14	23	28	15	10	14	0	5	0	20	4	133	11	12.1
28-Aug-15	5	6	6	2	2	7	0	3	1	7	0	39	11	3.5
29-Aug-15	6	20	2	2	1	7	0	0	3	8	3	52	11	4.7
30-Aug-15	11	8	1	4	0	10	0	3	3	6	0	46	11	4.2
31-Aug-15	2	12	2	3	---	6	0	0	4	8	0	37	10	3.7
1-Sep-15	---	9	2	5	2	0	2	4	0	10	0	56	10	5.6
2-Sep-15	---	22	2	25	3	---	2	1	2	23	1	81	9	9
3-Sep-15	---	13	3	32	2	---	0	2	3	5	3	63	9	7
4-Sep-15	---	6	2	3	---	---	0	0	5	0	0	16	8	2
5-Sep-15	---	4	1	5	---	---	1	0	1	2	0	14	8	1.8
6-Sep-15	---	2	3	2	---	---	0	0	0	6	3	16	8	2
7-Sep-15	---	1	1	0	---	---	0	1	0	4	1	8	8	1
8-Sep-15	---	15	7	14	---	---	1	3	4	10	0	54	8	6.8
9-Sep-15	---	1	5	16	---	---	0	3	1	3	2	31	8	3.9
10-Sep-15	---	2	1	4	---	---	2	0	1	1	0	11	8	1.4
11-Sep-15	---	13	2	5	---	---	3	2	1	1	0	27	8	3.4
12-Sep-15	---	6	3	1	---	---	1	2	1	5	0	19	8	2.4

Appendix A Bat Passes Recorded in the Outlaw trail Project Study Area

Table A- 1 Total Bat Passes Recorded in the Project Area During the Fall 2015 Monitoring Period

Night	Ground 1	Ground 2	Ground 3	Met 1 Low	Met 1 High	Met 2 Low	Met 2 High	Met 3 Low	Met 3 High	Met 4 Low	Met 4 High	Total Bat Passes Per Night	Number of Detector Nights	Bat Passes Per Detector Night (All Bats)
13-Sep-15	---	13	2	6	---	---	0	2	0	5	0	28	8	3.5
14-Sep-15	---	6	5	27	---	---	3	0	3	6	1	51	8	6.4
15-Sep-15	---	1	0	5	0	---	0	0	0	7	0	13	9	1.4
16-Sep-15	0	0	0	0	0	0	0	0	0	0	0	0	11	0
17-Sep-15	2	0	0	3	0	1	0	1	2	2	0	11	11	1
18-Sep-15	3	0	1	1	0	0	0	2	0	0	0	7	11	0.6
19-Sep-15	2	2	0	2	1	0	0	3	1	1	0	12	11	1.1
20-Sep-15	0	2	4	1	0	1	1	3	1	1	0	14	11	1.3
21-Sep-15	3	3	1	7	0	1	0	1	2	1	0	19	11	1.7
22-Sep-15	0	0	0	2	0	2	0	0	0	0	0	4	11	0.4
23-Sep-15	1	3	1	0	0	0	0	1	0	0	2	8	11	0.7
24-Sep-15	0	3	0	1	1	0	0	1	2	0	0	8	11	0.7
25-Sep-15	0	4	0	4	0	0	0	2	0	1	0	11	11	1
26-Sep-15	1	4	1	7	1	1	0	0	3	0	0	18	11	1.6
27-Sep-15	0	3	0	1	0	0	0	2	0	0	0	6	11	0.5
28-Sep-15	0	0	0	1	0	0	0	0	0	0	0	1	11	0.1
29-Sep-15	0	0	0	0	0	0	0	0	0	0	0	0	11	0
30-Sep-15	0	1	0	2	2	0	0	2	0	0	0	7	11	0.6
Total	585	1,003	646	464	137	321	56	571	222	686	116	4,807	N/A	6.0
Total # of Nights Per Detector	64	79	79	79	56	65	67	78	75	78	78	N/A	798	N/A

Appendix A Bat Passes Recorded in the Outlaw trail Project Study Area

Table A- 1 Total Bat Passes Recorded in the Project Area During the Fall 2015 Monitoring Period

Night	Ground 1	Ground 2	Ground 3	Met 1 Low	Met 1 High	Met 2 Low	Met 2 High	Met 3 Low	Met 3 High	Met 4 Low	Met 4 High	Total Bat Passes Per Night	Number of Detector Nights	Bat Passes Per Detector Night (All Bats)
# of Total Bat Passes Per Detector Night	9.1	12.7	8.2	5.9	2.5	4.94	0.8	7.3	3.0	8.8	1.5	6.0	N/A	N/A

--- indicates night of detector malfunction

N/A indicates night is outside of survey period or field is not applicable

Table A- 2 Migratory Bat Passes Recorded in the Project Area During the Fall 2015 Monitoring Period

Night	Ground 1	Ground 2	Ground 3	Met 1 Low	Met 1 High	Met 2 Low	Met 2 High	Met 3 Low	Met 3 High	Met 4 Low	Met 4 High	Total Bat Passes Per Night	Number of Detector Nights	Bat Passes Per Detector Night (Migratory Bats)
14-Jul-15	2	5	5	0	3	0	0	N/A	N/A	N/A	N/A	15	7	2.1
15-Jul-15	2	7	3	0	3	0	0	2	3	0	0	20	11	1.8
16-Jul-15	0	3	2	0	0	0	0	3	2	0	0	10	11	0.9
17-Jul-15	1	2	1	0	0	0	0	3	1	0	0	8	11	0.7
18-Jul-15	1	3	3	1	1	0	0	3	1	4	0	17	11	1.5
19-Jul-15	2	6	5	1	0	1	0	8	2	2	0	27	11	2.5
20-Jul-15	0	6	0	0	0	2	0	9	0	1	0	18	11	1.6
21-Jul-15	0	8	2	0	0	0	1	5	1	1	0	18	11	1.6
22-Jul-15	4	8	3	0	1	1	1	7	1	0	0	26	11	2.4

Table A- 2 Migratory Bat Passes Recorded in the Project Area During the Fall 2015 Monitoring Period

Night	Ground 1	Ground 2	Ground 3	Met 1 Low	Met 1 High	Met 2 Low	Met 2 High	Met 3 Low	Met 3 High	Met 4 Low	Met 4 High	Total Bat Passes Per Night	Number of Detector Nights	Bat Passes Per Detector Night (Migratory Bats)
23-Jul-15	1	4	3	0	4	4	1	9	2	2	0	30	11	2.7
24-Jul-15	4	3	0	0	0	1	1	1	2	4	1	17	11	1.5
25-Jul-15	5	4	5	0	3	2	1	4	3	5	0	32	11	2.9
26-Jul-15	5	12	1	1	6	4	4	9	6	6	3	57	11	5.2
27-Jul-15	3	3	4	0	---	5	0	9	---	0	2	26	9	2.9
28-Jul-15	4	1	1	0	---	3	---	6	---	6	0	21	8	2.6
29-Jul-15	3	17	3	0	---	2	---	4	---	1	1	31	8	3.9
30-Jul-15	3	12	3	0	---	3	---	3	5	2	3	34	9	3.8
31-Jul-15	5	2	4	0	2	0	1	5	3	2	1	25	11	2.3
1-Aug-15	13	5	7	1	4	5	1	7	2	7	0	52	11	4.7
2-Aug-15	12	3	8	1	1	4	5	12	8	2	2	58	11	5.3
3-Aug-15	4	14	3	1	2	2	1	2	2	4	1	36	11	3.3
4-Aug-15	6	26	1	1	0	0	2	0	0	4	1	41	11	3.7
5-Aug-15	3	4	3	1	---	2	1	0	3	1	2	20	10	2
6-Aug-15	7	2	3	0	---	1	1	8	3	9	0	34	10	3.4
7-Aug-15	11	6	5	0	---	1	4	14	8	12	2	63	10	6.3
8-Aug-15	2	8	6	1	---	3	2	9	10	0	0	41	10	4.1
9-Aug-15	2	5	5	2	---	4	3	5	6	1	3	36	10	3.6
10-Aug-15	2	3	3	0	---	1	5	3	0	0	2	19	10	1.9

Table A- 2 Migratory Bat Passes Recorded in the Project Area During the Fall 2015 Monitoring Period

Night	Ground 1	Ground 2	Ground 3	Met 1 Low	Met 1 High	Met 2 Low	Met 2 High	Met 3 Low	Met 3 High	Met 4 Low	Met 4 High	Total Bat Passes Per Night	Number of Detector Nights	Bat Passes Per Detector Night (Migratory Bats)
11-Aug-15	8	7	2	0	---	4	4	2	0	3	3	33	10	3.3
12-Aug-15	7	5	0	1	7	3	0	7	5	7	0	42	11	3.8
13-Aug-15	5	5	3	0	4	2	---	2	4	5	2	32	10	3.2
14-Aug-15	16	8	4	1	6	0	---	1	4	1	3	44	10	4.4
15-Aug-15	4	2	0	2	1	5	---	3	7	3	3	30	10	3
16-Aug-15	2	6	3	1	6	4	---	5	3	6	4	40	10	4
17-Aug-15	4	9	5	2	4	6	---	1	11	6	4	52	10	5.2
18-Aug-15	6	5	8	4	3	1	---	1	2	3	0	33	10	3.3
19-Aug-15	2	12	2	0	8	3	---	1	7	1	2	38	10	3.8
20-Aug-15	5	22	3	1	1	7	---	0	8	3	4	54	10	5.4
21-Aug-15	17	11	8	4	17	31	---	1	17	15	12	133	10	13.3
22-Aug-15	13	1	5	0	1	5	---	4	1	6	0	36	10	3.6
23-Aug-15	0	9	3	1	1	0	0	1	6	3	2	26	11	2.4
24-Aug-15	4	2	3	1	3	7	0	0	3	4	2	29	11	2.6
25-Aug-15	6	19	6	1	2	4	0	2	1	7	2	50	11	4.5
26-Aug-15	3	12	6	0	2	3	0	0	8	1	0	35	11	3.2
27-Aug-15	7	7	6	2	10	7	0	2	0	10	2	53	11	4.8
28-Aug-15	1	2	3	1	2	3	0	0	1	2	0	15	11	1.4
29-Aug-15	4	7	1	2	1	2	0	0	3	4	2	26	11	2.4

Table A- 2 Migratory Bat Passes Recorded in the Project Area During the Fall 2015 Monitoring Period

Night	Ground 1	Ground 2	Ground 3	Met 1 Low	Met 1 High	Met 2 Low	Met 2 High	Met 3 Low	Met 3 High	Met 4 Low	Met 4 High	Total Bat Passes Per Night	Number of Detector Nights	Bat Passes Per Detector Night (Migratory Bats)
30-Aug-15	6	3	0	0	0	1	0	0	3	0	0	13	11	1.2
31-Aug-15	2	6	1	1	---	1	0	0	4	1	0	16	10	1.6
1-Sep-15	---	3	0	0	1	0	2	1	0	2	0	9	10	0.9
2-Sep-15	---	6	1	5	1	---	2	0	2	3	1	21	9	2.3
3-Sep-15	---	8	2	9	1	---	0	2	3	3	3	31	9	3.4
4-Sep-15	---	5	1	1	---	---	0	0	5	0	0	12	8	1.5
5-Sep-15	---	2	1	1	---	---	1	0	1	1	0	7	8	0.9
6-Sep-15	---	1	0	1	---	---	0	0	0	0	2	4	8	0.5
7-Sep-15	---	1	0	0	---	---	0	1	0	3	1	6	8	0.8
8-Sep-15	---	7	0	6	---	---	1	0	3	0	0	17	8	2.1
9-Sep-15	---	0	1	1	---	---	0	0	1	0	0	3	8	0.4
10-Sep-15	---	1	1	2	---	---	2	0	1	0	0	7	8	0.9
11-Sep-15	---	3	2	0	---	---	3	2	1	0	0	11	8	1.4
12-Sep-15	---	3	1	0	---	---	1	1	1	1	0	8	8	1
13-Sep-15	---	6	0	1	---	---	0	1	0	0	0	8	8	1
14-Sep-15	---	5	5	23	---	---	3	0	3	6	1	46	8	5.8
15-Sep-15	---	0	0	1	0	---	0	0	0	6	0	7	9	0.8
16-Sep-15	0	0	0	0	0	0	0	0	0	0	0	0	11	0
17-Sep-15	2	0	0	1	0	1	0	0	2	1	0	7	11	0.6

Table A- 2 Migratory Bat Passes Recorded in the Project Area During the Fall 2015 Monitoring Period

Night	Ground 1	Ground 2	Ground 3	Met 1 Low	Met 1 High	Met 2 Low	Met 2 High	Met 3 Low	Met 3 High	Met 4 Low	Met 4 High	Total Bat Passes Per Night	Number of Detector Nights	Bat Passes Per Detector Night (Migratory Bats)
18-Sep-15	0	0	1	0	0	0	0	1	0	0	0	2	11	0.2
19-Sep-15	2	2	0	0	1	0	0	1	1	1	0	8	11	0.7
20-Sep-15	0	2	3	1	0	0	1	2	1	0	0	10	11	0.9
21-Sep-15	1	3	0	0	0	1	0	0	1	0	0	6	11	0.5
22-Sep-15	0	0	0	1	0	2	0	0	0	0	0	3	11	0.3
23-Sep-15	1	2	1	0	0	0	0	1	0	0	2	7	11	0.6
24-Sep-15	0	3	0	1	1	0	0	1	2	0	0	8	11	0.7
25-Sep-15	0	3	0	2	0	0	0	1	0	0	0	6	11	0.5
26-Sep-15	0	3	1	4	0	0	0	0	3	0	0	11	11	1
27-Sep-15	0	1	0	0	0	0	0	1	0	0	0	2	11	0.2
28-Sep-15	0	0	0	0	0	0	0	0	0	0	0	0	11	0
29-Sep-15	0	0	0	0	0	0	0	0	0	0	0	0	11	0
30-Sep-15	0	1	0	1	1	0	0	0	0	0	0	3	11	0.3
Total	235	413	185	98	115	154	55	199	203	194	81	1,932	N/A	2.4
Total # of Nights Per Detector	64	79	79	79	56	65	67	78	75	78	78	N/A	798	N/A
# of Migratory Bat Passes Per Detector Night	3.7	5.2	2.3	1.2	2.1	2.4	0.8	2.6	2.7	2.5	1.0	2.4	N/A	N/A

--- indicates night of detector malfunction
N/A indicates night is outside of survey period or field is not applicable

Appendix A Bat Passes Recorded in the Outlaw trail Project Study Area

Table A- 3 Total Bat Passes Recorded in the Project Area During the Spring 2016 Monitoring Period

Night	Ground 1	Ground 2	Ground 3	Met 1 Low	Met 1 High	Met 2 Low	Met 2 High	Met 3 Low	Met 3 High	Met 4 Low	Met 4 High	Total Bat Passes Per Night	Number of Detector Nights	Bat Passes Per Detector Night (Migratory Bats)
29-Apr-16	0	0	N/A	1	0	N/A	N/A	N/A	N/A	N/A	N/A	1	4	0.3
30-Apr-16	0	0	3	1	1	0	0	2	0	0	0	7	11	0.6
1-May-16	0	0	2	1	0	0	0	5	1	1	0	10	11	0.9
2-May-16	1	0	6	2	2	0	0	11	0	8	0	30	11	2.7
3-May-16	2	0	4	2	0	---	0	4	0	9	1	22	10	2.2
4-May-16	3	0	2	1	0	---	0	3	2	4	0	15	10	1.5
5-May-16	1	0	1	4	0	---	0	2	0	0	0	8	10	0.8
6-May-16	0	0	2	8	0	---	0	7	0	5	0	22	10	2.2
7-May-16	1	1	4	3	0	---	0	6	0	1	0	16	10	1.6
8-May-16	0	1	1	3	0	---	0	6	0	5	0	16	10	1.6
9-May-16	0	0	0	0	0	---	0	2	0	0	0	2	10	0.2
10-May-16	0	0	0	0	0	---	0	0	0	---	0	0	9	0.0
11-May-16	0	0	0	0	0	---	0	0	0	---	0	0	9	0.0
12-May-16	0	1	0	0	0	---	0	0	0	---	0	1	9	0.1
13-May-16	0	0	0	2	0	---	0	0	0	---	0	2	9	0.2
14-May-16	0	0	3	1	0	---	0	0	1	3	2	10	9	1.1
15-May-16	0	0	5	2	0	---	0	0	1	6	0	14	9	1.6
16-May-16	0	0	0	0	1	0	0	2	1	3	0	7	11	0.6
17-May-16	1	0	9	3	0	0	0	9	0	2	0	24	11	2.2
18-May-16	2	0	3	3	1	1	0	10	2	3	1	26	11	2.4
19-May-16	1	1	0	1	0	0	0	7	0	5	0	15	11	1.4
20-May-16	1	1	0	0	0	0	0	1	1	0	0	4	11	0.4
21-May-16	2	0	1	0	0	0	0	3	0	0	0	6	11	0.6

Table A- 3 Total Bat Passes Recorded in the Project Area During the Spring 2016 Monitoring Period

Night	Ground 1	Ground 2	Ground 3	Met 1 Low	Met 1 High	Met 2 Low	Met 2 High	Met 3 Low	Met 3 High	Met 4 Low	Met 4 High	Total Bat Passes Per Night	Number of Detector Nights	Bat Passes Per Detector Night (Migratory Bats)
22-May-16	1	0	1	1	1	0	1	6	0	5	0	16	11	1.5
23-May-16	0	1	1	0	0	0	0	2	0	2	0	6	11	0.6
24-May-16	1	2	0	0	0	0	0	5	0	0	0	8	11	0.7
25-May-16	0	0	0	0	0	0	0	1	0	2	0	3	11	0.3
26-May-16	1	0	0	3	0	0	0	6	0	2	0	12	11	1.1
27-May-16	1	0	2	1	1	1	0	3	0	8	0	17	11	1.6
28-May-16	0	0	1	3	0	1	1	4	2	2	0	14	11	1.3
29-May-16	3	0	7	6	0	1	0	8	0	7	0	32	11	2.9
30-May-16	0	0	0	0	1	0	0	0	0	0	0	1	11	0.1
31-May-16	0	0	0	0	0	1	0	1	0	1	0	3	11	0.3
1-Jun-16	3	0	8	1	1	1	0	2	0	5	0	21	11	1.9
2-Jun-16	1	0	3	0	0	0	1	5	0	3	0	13	11	1.2
3-Jun-16	0	1	5	5	0	0	0	4	0	3	0	18	11	1.6
4-Jun-16	5	0	9	5	0	0	0	22	2	7	0	50	11	4.6
5-Jun-16	1	0	6	5	1	2	0	55	0	7	0	77	11	7.0
6-Jun-16	2	0	2	4	0	0	0	6	0	N/A	N/A	14	9	1.6
7-Jun-16	N/A	N/A	N/A	1	0	N/A	N/A	3	0	N/A	N/A	4	4	1.0
Total	34	9	91	73	10	8	3	213	13	109	4	567	N/A	N/A
Total # of Nights Per Detector	39	39	38	40	40	25	38	33	39	37	37	N/A	405	N/A
# of Total Bat Passes Per Detector Night	0.9	0.2	2.4	1.8	0.2	0.3	0.1	6.5	0.3	2.9	0.1	1.3	N/A	N/A
--- indicates night of detector malfunction														

Table A- 3 Total Bat Passes Recorded in the Project Area During the Spring 2016 Monitoring Period

Night	Ground 1	Ground 2	Ground 3	Met 1 Low	Met 1 High	Met 2 Low	Met 2 High	Met 3 Low	Met 3 High	Met 4 Low	Met 4 High	Total Bat Passes Per Night	Number of Detector Nights	Bat Passes Per Detector Night (Migratory Bats)
N/A indicates night is outside of survey period or field is not applicable														

Table A- 4 Migratory Bat Passes Recorded in the Project Area During the Spring 2016 Monitoring Period

Night	Ground 1	Ground 2	Ground 3	Met 1 Low	Met 1 High	Met 2 Low	Met 2 High	Met 3 Low	Met 3 High	Met 4 Low	Met 4 High	Total Bat Passes Per Night	Number of Detector Nights	Bat Passes Per Detector Night (Migratory Bats)
29-Apr-16	0	0	N/A	0	0	N/A	N/A	N/A	N/A	N/A	N/A	0	4	0.0
30-Apr-16	0	0	0	0	1	0	0	0	0	0	0	1	11	0.1
1-May-16	0	0	2	0	0	0	0	0	1	0	0	3	11	0.3
2-May-16	0	0	1	0	1	0	0	0	0	1	0	3	11	0.3
3-May-16	2	0	3	1	0	---	0	0	0	1	1	8	10	0.8
4-May-16	1	0	0	0	0	---	0	0	2	0	0	3	10	0.3
5-May-16	0	0	0	1	0	---	0	2	0	0	0	3	10	0.3
6-May-16	0	0	0	0	0	---	0	1	0	0	0	1	10	0.1
7-May-16	0	1	0	0	0	---	0	0	0	0	0	1	10	0.1
8-May-16	0	1	0	1	0	---	0	3	0	1	0	6	10	0.6
9-May-16	0	0	0	0	0	---	0	2	0	0	0	2	10	0.2
10-May-16	0	0	0	0	0	---	0	0	0	---	0	0	9	0.0

Table A- 4 Migratory Bat Passes Recorded in the Project Area During the Spring 2016 Monitoring Period

Night	Ground 1	Ground 2	Ground 3	Met 1 Low	Met 1 High	Met 2 Low	Met 2 High	Met 3 Low	Met 3 High	Met 4 Low	Met 4 High	Total Bat Passes Per Night	Number of Detector Nights	Bat Passes Per Detector Night (Migratory Bats)
11-May-16	0	0	0	0	0	---	0	0	0	---	0	0	9	0.0
12-May-16	0	0	0	0	0	---	0	0	0	---	0	0	9	0.0
13-May-16	0	0	0	1	0	---	0	0	0	---	0	1	9	0.1
14-May-16	0	0	1	0	0	---	0	0	1	2	2	6	9	0.7
15-May-16	0	0	0	1	0	---	0	0	1	0	0	2	9	0.2
16-May-16	0	0	0	0	0	0	0	0	1	0	0	1	11	0.1
17-May-16	1	0	0	2	0	0	0	0	0	0	0	3	11	0.3
18-May-16	2	0	0	0	1	0	0	2	2	0	1	8	11	0.7
19-May-16	1	0	0	0	0	0	0	0	0	1	0	2	11	0.2
20-May-16	0	1	0	0	0	0	0	1	1	0	0	3	11	0.3
21-May-16	1	0	0	0	0	0	0	1	0	0	0	2	11	0.2
22-May-16	1	0	0	0	1	0	1	1	0	0	0	4	11	0.4
23-May-16	0	1	0	0	0	0	0	0	0	0	0	1	11	0.1
24-May-16	0	2	0	0	0	0	0	1	0	0	0	3	11	0.3
25-May-16	0	0	0	0	0	0	0	0	0	0	0	0	11	0.0
26-May-16	0	0	0	0	0	0	0	1	0	0	0	1	11	0.1
27-May-16	1	0	0	0	1	1	0	0	0	0	0	3	11	0.3
28-May-16	0	0	0	1	0	1	1	1	2	0	0	6	11	0.6

Table A- 4 Migratory Bat Passes Recorded in the Project Area During the Spring 2016 Monitoring Period

Night	Ground 1	Ground 2	Ground 3	Met 1 Low	Met 1 High	Met 2 Low	Met 2 High	Met 3 Low	Met 3 High	Met 4 Low	Met 4 High	Total Bat Passes Per Night	Number of Detector Nights	Bat Passes Per Detector Night (Migratory Bats)
29-May-16	1	0	0	1	0	1	0	0	0	0	0	3	11	0.3
30-May-16	0	0	0	0	1	0	0	0	0	0	0	1	11	0.1
31-May-16	0	0	0	0	0	1	0	0	0	0	0	1	11	0.1
1-Jun-16	1	0	1	0	1	0	0	0	0	0	0	3	11	0.3
2-Jun-16	0	0	0	0	0	0	1	3	0	0	0	4	11	0.4
3-Jun-16	0	1	1	2	0	0	0	1	0	1	0	6	11	0.6
4-Jun-16	4	0	1	3	0	0	0	3	2	0	0	13	11	1.2
5-Jun-16	0	0	1	1	1	1	0	1	0	2	0	7	11	0.6
6-Jun-16	1	0	0	1	0	0	0	0	0	0	0	2	9	0.2
7-Jun-16	0	0	0	0	0	0	0	0	0	0	0	0	4	0.0
Total	17	7	11	16	8	5	3	24	13	9	4	117	N/A	N/A
Total # of Nights Per Detector	39	39	38	40	40	25	38	33	39	37	37	N/A	405	N/A
# of Migratory Bat Passes Per Detector Night	0.4	0.2	0.3	0.4	0.2	0.2	0.1	0.7	0.3	0.2	0.1	0.3	N/A	N/A

Table A- 5 Total Bat Passes Recorded in the Project Area During the Fall 2016 Monitoring Period

Night	Ground 1	Ground 2	Ground 3	Met 1 Low	Met 1 High	Met 2 Low	Met 2 High	Met 3 Low	Met 3 High	Met 4 Low	Met 4 High	Total Bat Passes Per Night	Number of Detector Nights	Bat Passes Per Detector Night (Migratory Bats)
28-Jul-16	11	1	50	10	2	2	1	20	5	23	0	125	11	11.4
29-Jul-16	15	5	52	27	5	5	1	23	3	9	4	149	11	13.6
30-Jul-16	8	4	17	10	2	2	2	7	4	5	2	63	11	5.7
31-Jul-16	28	7	12	37	7	8	0	28	8	31	0	166	11	15.1
1-Aug-16	15	4	14	34	5	4	1	16	2	23	1	119	11	10.8
2-Aug-16	4	4	4	15	2	4	2	8	3	13	2	61	11	5.6
3-Aug-16	1	0	0	2	3	0	0	4	1	0	0	11	11	1.0
4-Aug-16	13	4	14	13	7	11	3	24	33	30	0	152	11	13.8
5-Aug-16	9	6	2	23	8	7	3	15	7	19	0	99	11	9.0
6-Aug-16	5	5	2	7	0	1	0	7	3	4	0	34	11	3.1
7-Aug-16	8	1	7	14	---	11	---	17	7	2	---	67	8	8.4
8-Aug-16	14	11	12	45	---	17	---	25	---	16	---	140	7	20.0
9-Aug-16	4	4	4	19	---	6	---	9	---	8	---	54	7	7.7
10-Aug-16	11	2	11	17	---	5	---	17	---	---	---	63	6	10.5
11-Aug-16	13	4	9	30	---	8	---	24	---	---	---	88	6	14.7
12-Aug-16	18	5	7	30	---	5	---	19	---	---	---	84	6	14.0
13-Aug-16	7	10	13	21	---	4	---	15	---	---	---	70	6	11.7
14-Aug-16	6	6	6	27	---	7	---	17	---	---	---	69	6	11.5
15-Aug-16	9	7	11	55	---	16	---	11	---	---	---	109	6	18.2
16-Aug-16	8	7	4	3	---	9	---	11	---	---	---	42	6	7.0
17-Aug-16	8	3	3	27	---	4	---	16	---	---	---	61	6	10.2

Table A- 5 Total Bat Passes Recorded in the Project Area During the Fall 2016 Monitoring Period

Night	Ground 1	Ground 2	Ground 3	Met 1 Low	Met 1 High	Met 2 Low	Met 2 High	Met 3 Low	Met 3 High	Met 4 Low	Met 4 High	Total Bat Passes Per Night	Number of Detector Nights	Bat Passes Per Detector Night (Migratory Bats)
18-Aug-16	11	4	4	39	2	2	3	10	4	6	2	87	11	7.9
19-Aug-16	8	1	8	23	6	2	0	16	1	10	2	77	11	7.0
20-Aug-16	7	6	5	19	3	7	2	18	3	21	5	96	11	8.7
21-Aug-16	12	7	8	10	5	12	1	10	0	5	3	73	11	6.6
22-Aug-16	14	3	6	63	7	3	2	15	5	39	9	166	11	15.1
23-Aug-16	5	0	2	8	---	1	---	4	4	6	0	30	9	3.3
24-Aug-16	20	2	6	28	---	1	---	28	5	15	2	107	9	11.9
25-Aug-16	8	3	18	27	---	3	---	35	3	9	8	114	9	12.7
26-Aug-16	1	3	5	10	---	3	---	22	0	17	2	63	9	7.0
27-Aug-16	5	0	6	1	---	3	---	5	7	9	6	42	9	4.7
28-Aug-16	24	4	2	51	---	1	---	13	1	30	1	127	9	14.1
29-Aug-16	6	3	2	15	---	10	---	3	7	8	3	57	9	6.3
30-Aug-16	3	4	6	13	---	12	---	8	5	8	1	60	9	6.7
31-Aug-16	3	1	2	7	7	3	2	4	8	3	6	46	11	4.2
1-Sep-16	4	0	7	11	3	4	2	1	0	3	3	38	11	3.5
2-Sep-16	10	1	3	46	2	3	1	11	1	7	0	85	11	7.7
3-Sep-16	4	2	3	20	1	4	3	6	8	7	0	58	11	5.3
4-Sep-16	2	0	1	12	1	1	0	3	3	3	2	28	11	2.6
5-Sep-16	2	2	0	2	5	1	2	1	1	1	---	17	10	1.7
6-Sep-16	6	3	2	5	2	7	1	7	4	5	---	42	10	4.2
7-Sep-16	2	1	2	9	6	0	0	1	2	9	---	32	10	3.2

Table A- 5 Total Bat Passes Recorded in the Project Area During the Fall 2016 Monitoring Period

Night	Ground 1	Ground 2	Ground 3	Met 1 Low	Met 1 High	Met 2 Low	Met 2 High	Met 3 Low	Met 3 High	Met 4 Low	Met 4 High	Total Bat Passes Per Night	Number of Detector Nights	Bat Passes Per Detector Night (Migratory Bats)
8-Sep-16	0	0	1	7	3	0	0	1	0	0	---	12	10	1.2
9-Sep-16	1	2	1	2	0	0	0	5	0	0	---	11	10	1.1
10-Sep-16	1	3	6	7	---	3	0	7	---	5	---	32	8	4.0
11-Sep-16	2	1	0	3	---	1	1	1	---	0	---	9	8	1.1
12-Sep-16	0	0	0	1	---	0	0	0	---	0	---	1	8	0.1
13-Sep-16	0	0	0	0	---	0	0	0	---	0	---	0	8	0.0
Total	376	156	360	905	94	223	33	568	148	409	64	3,336	N/A	N/A
Total # of Nights Per Detector	48	48	48	48	25	48	29	48	34	40	28	N/A	444	N/A
# of Total Bat Passes Per Detector Night	7.8	3.2	7.5	18.9	3.8	4.6	1.1	11.8	4.4	10.2	2.3	7.5	N/A	N/A

--- indicates night of detector malfunction
N/A indicates night is outside of survey period or field is not applicable

Table A- 6 Migratory Bat Passes Recorded in the Project Area During the Fall 2016 Monitoring Period

Night	Ground 1	Ground 2	Ground 3	Met 1 Low	Met 1 High	Met 2 Low	Met 2 High	Met 3 Low	Met 3 High	Met 4 Low	Met 4 High	Total Bat Passes Per Night	Number of Detector Nights	Bat Passes Per Detector Night (Migratory Bats)
28-Jul-16	0	1	2	4	2	1	1	7	4	1	0	23	11	2.1
29-Jul-16	5	2	5	5	3	2	1	9	2	2	4	40	11	3.6
30-Jul-16	6	4	12	4	1	2	2	4	4	2	1	42	11	3.8
31-Jul-16	10	6	8	3	3	3	0	9	5	13	0	60	11	5.5
1-Aug-16	5	3	5	2	2	3	1	7	2	13	1	44	11	4.0
2-Aug-16	2	2	2	9	1	3	2	2	3	0	2	28	11	2.6
3-Aug-16	1	0	0	2	3	0	0	4	1	0	0	11	11	1.0
4-Aug-16	5	4	4	3	5	8	3	18	33	2	0	85	11	7.7
5-Aug-16	1	4	0	4	8	2	3	8	7	1	0	38	11	3.5
6-Aug-16	2	5	0	2	0	1	0	2	3	2	0	17	11	1.6
7-Aug-16	4	0	5	9	---	9	---	10	6	1	---	44	8	5.5
8-Aug-16	11	6	2	9	---	10	---	10	---	4	---	52	7	7.4
9-Aug-16	2	3	4	1	---	3	---	5	---	0	---	18	7	2.6
10-Aug-16	3	1	4	7	---	3	---	13	---	---	---	31	6	5.2
11-Aug-16	7	1	6	6	---	3	---	10	---	---	---	33	6	5.5
12-Aug-16	8	4	5	6	---	3	---	8	---	---	---	34	6	5.7
13-Aug-16	4	8	4	5	---	3	---	8	---	---	---	32	6	5.3
14-Aug-16	3	3	3	1	---	2	---	7	---	---	---	19	6	3.2

Table A- 6 Migratory Bat Passes Recorded in the Project Area During the Fall 2016 Monitoring Period

Night	Ground 1	Ground 2	Ground 3	Met 1 Low	Met 1 High	Met 2 Low	Met 2 High	Met 3 Low	Met 3 High	Met 4 Low	Met 4 High	Total Bat Passes Per Night	Number of Detector Nights	Bat Passes Per Detector Night (Migratory Bats)
15-Aug-16	3	4	5	7	---	12	---	3	---	---	---	34	6	5.7
16-Aug-16	4	5	2	1	---	6	---	4	---	---	---	22	6	3.7
17-Aug-16	6	1	1	3	---	3	---	10	---	---	---	24	6	4.0
18-Aug-16	7	3	3	5	2	0	3	4	4	4	0	35	11	3.2
19-Aug-16	3	0	1	1	5	0	0	2	0	2	2	16	11	1.5
20-Aug-16	1	2	2	3	2	4	2	9	3	9	5	42	11	3.8
21-Aug-16	9	4	5	1	5	10	1	3	0	2	3	43	11	3.9
22-Aug-16	6	2	3	5	2	1	1	6	3	11	3	43	11	3.9
23-Aug-16	4	0	1	0	---	1	---	4	4	6	0	20	9	2.2
24-Aug-16	8	1	5	0	---	1	---	14	5	3	2	39	9	4.3
25-Aug-16	4	2	8	8	---	2	---	5	3	1	7	40	9	4.4
26-Aug-16	0	3	1	2	---	2	---	10	0	2	2	22	9	2.4
27-Aug-16	3	0	3	0	---	3	---	1	5	2	6	23	9	2.6
28-Aug-16	12	2	0	3	---	0	---	1	1	7	0	26	9	2.9
29-Aug-16	3	2	1	4	---	6	---	3	6	4	3	32	9	3.6
30-Aug-16	2	2	1	4	---	5	---	6	5	5	1	31	9	3.4
31-Aug-16	3	1	2	2	7	1	2	2	8	3	6	37	11	3.4
1-Sep-16	3	0	3	3	3	1	1	0	0	0	2	16	11	1.5

Table A- 6 Migratory Bat Passes Recorded in the Project Area During the Fall 2016 Monitoring Period

Night	Ground 1	Ground 2	Ground 3	Met 1 Low	Met 1 High	Met 2 Low	Met 2 High	Met 3 Low	Met 3 High	Met 4 Low	Met 4 High	Total Bat Passes Per Night	Number of Detector Nights	Bat Passes Per Detector Night (Migratory Bats)
2-Sep-16	3	0	2	5	0	1	1	3	1	4	0	20	11	1.8
3-Sep-16	2	1	1	5	1	1	3	3	6	2	0	25	11	2.3
4-Sep-16	1	0	1	2	1	1	0	1	0	0	1	8	11	0.7
5-Sep-16	2	2	0	2	5	0	2	0	1	0	---	14	10	1.4
6-Sep-16	1	3	2	5	2	4	1	1	3	3	---	25	10	2.5
7-Sep-16	1	1	0	0	1	0	0	0	0	3	---	6	10	0.6
8-Sep-16	0	0	1	0	2	0	0	1	0	0	---	4	10	0.4
9-Sep-16	1	1	0	0	0	0	0	1	0	0	---	3	10	0.3
10-Sep-16	1	3	4	1	---	2	0	2	---	2	---	15	8	1.9
11-Sep-16	2	1	0	1	---	1	1	1	---	0	---	7	8	0.9
12-Sep-16	0	0	0	1	---	0	0	0	---	0	---	1	8	0.1
13-Sep-16	0	0	0	0	---	0	0	0	---	0	---	0	8	0.0
Total	174	103	129	156	66	129	31	241	128	116	51	1,324	N/A	N/A
Total # of Nights Per Detector	48	48	48	48	25	48	29	48	34	40	28	N/A	444	N/A
# of Migratory Bat Passes Per Detector Night	3.6	2.1	2.7	3.2	2.6	2.7	1.1	5	3.8	2.9	1.8	3.5	N/A	N/A

--- indicates night of detector malfunction
N/A indicates night is outside of survey period or field is not applicable

Appendix B BAT PASSES BY SPECIES OR SPECIES GROUPING RECORDED IN THE OUTLAW TRAIL PROJECT AREA

Appendix B Bat Passes by Species or Species Grouping Recorded in the Outlaw Trail Project Area

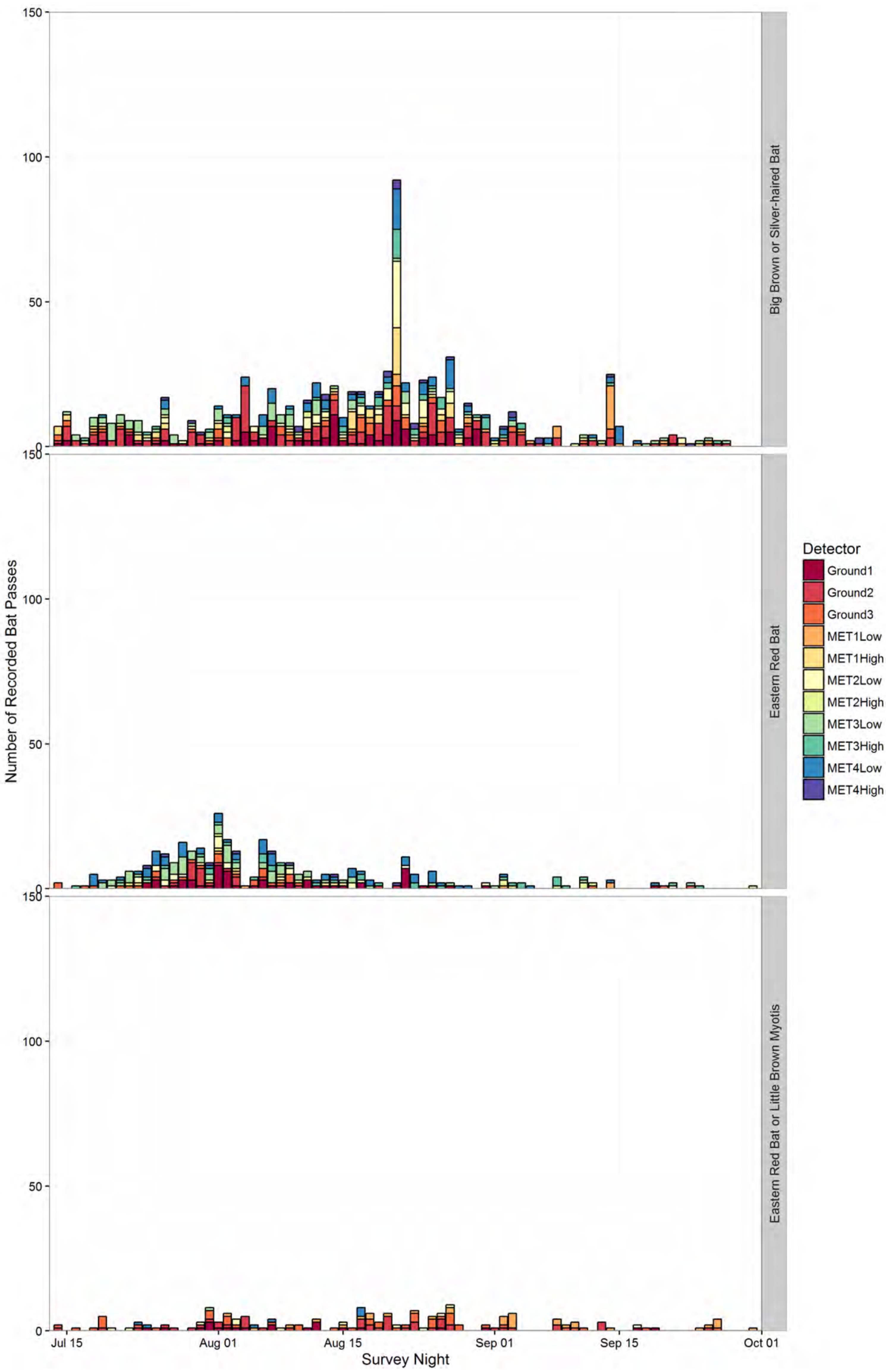

Figure B- 1 Bat Passes per Species by Detector During the 2015 Fall Monitoring Period

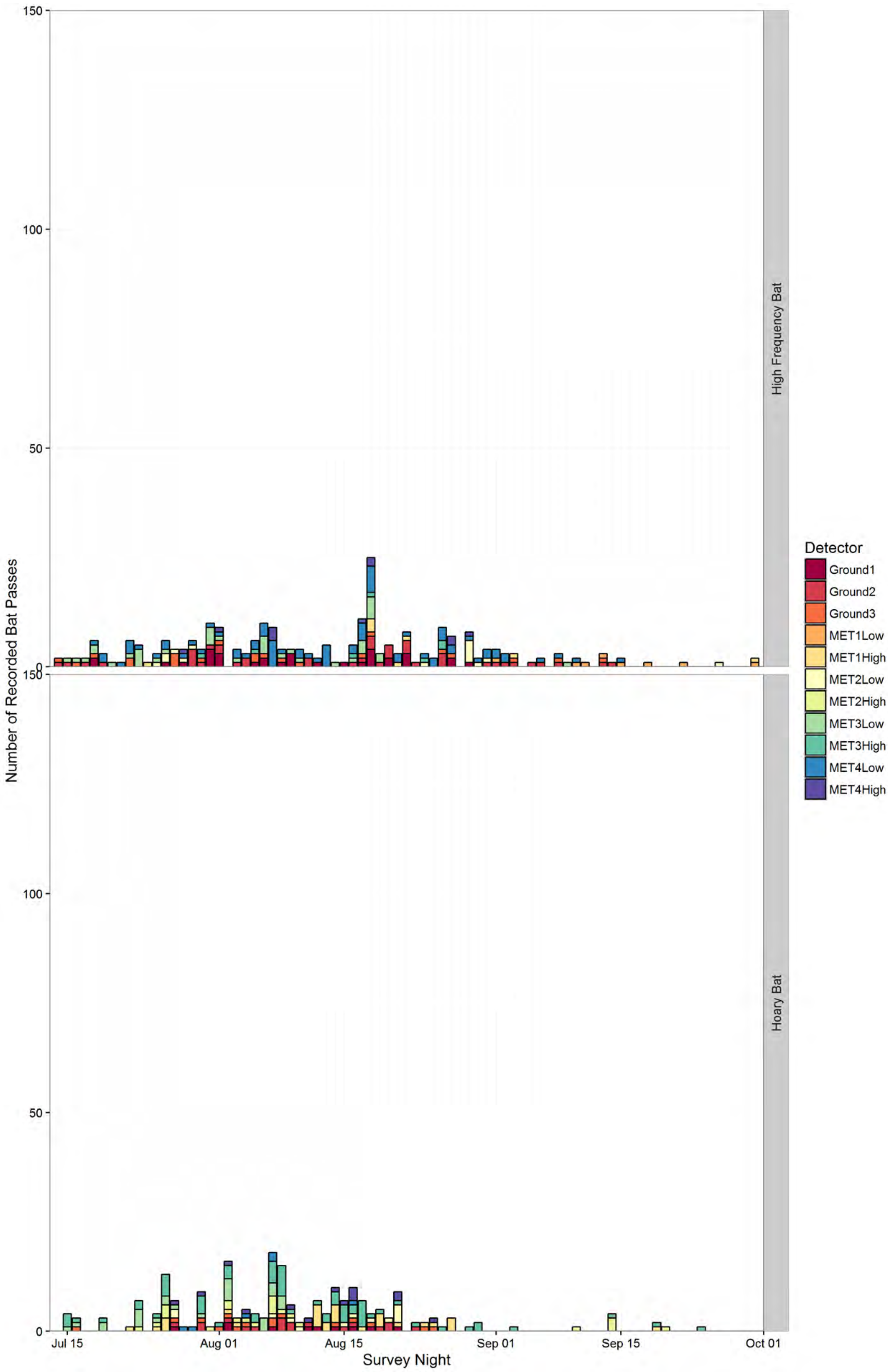

Figure B-1 (Continued)

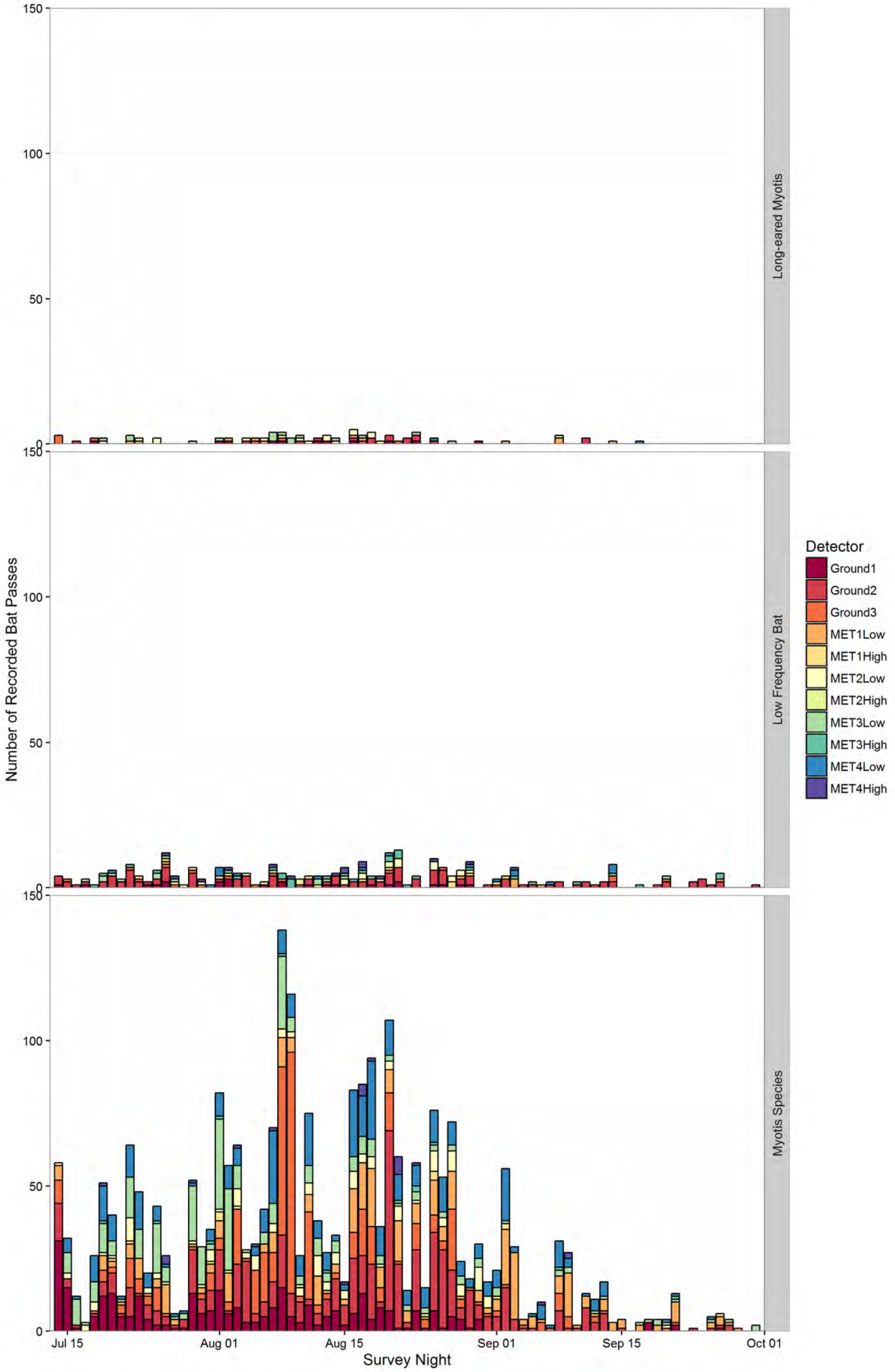

Figure B-1 (Continued)

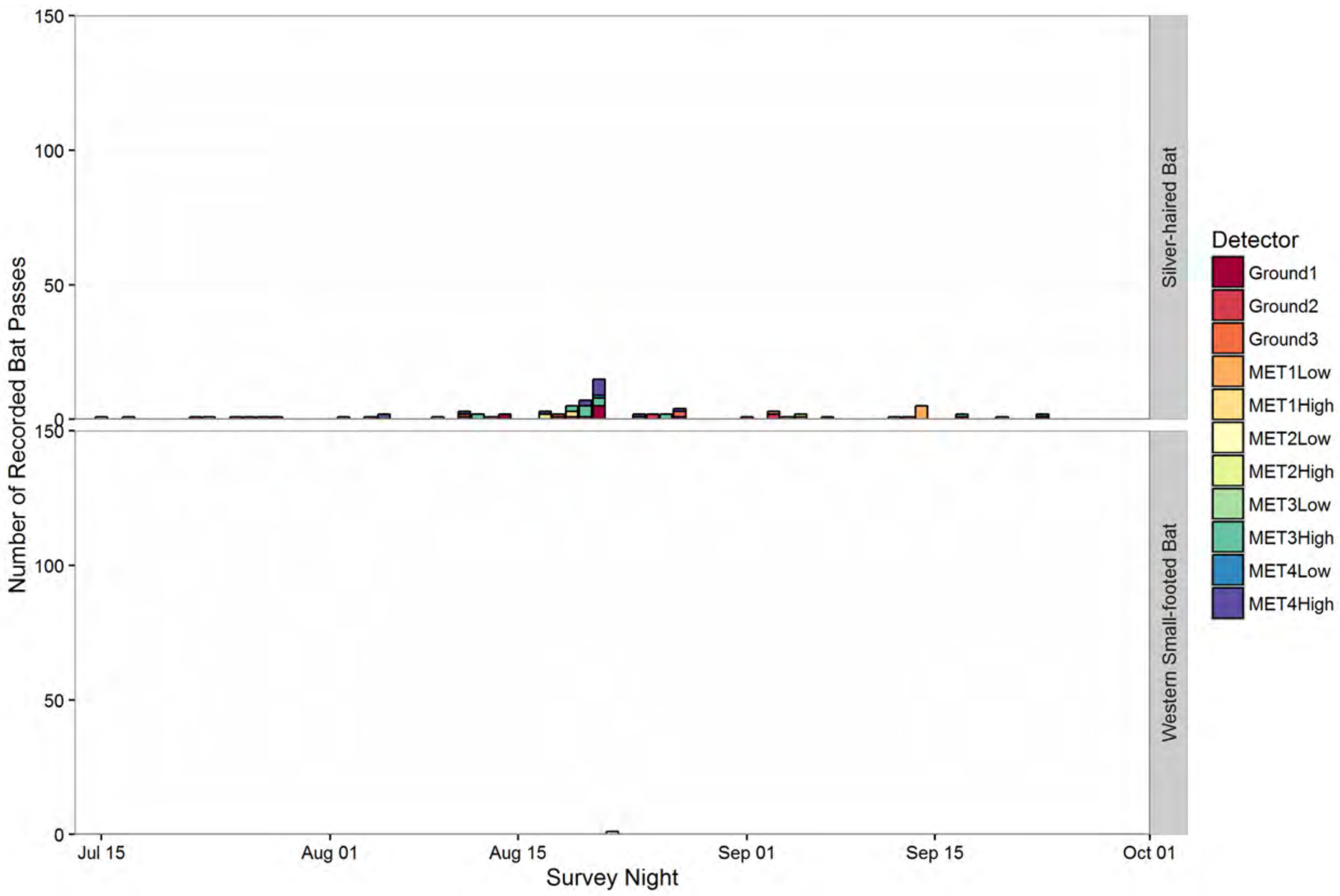

Figure B-1 (Continued)

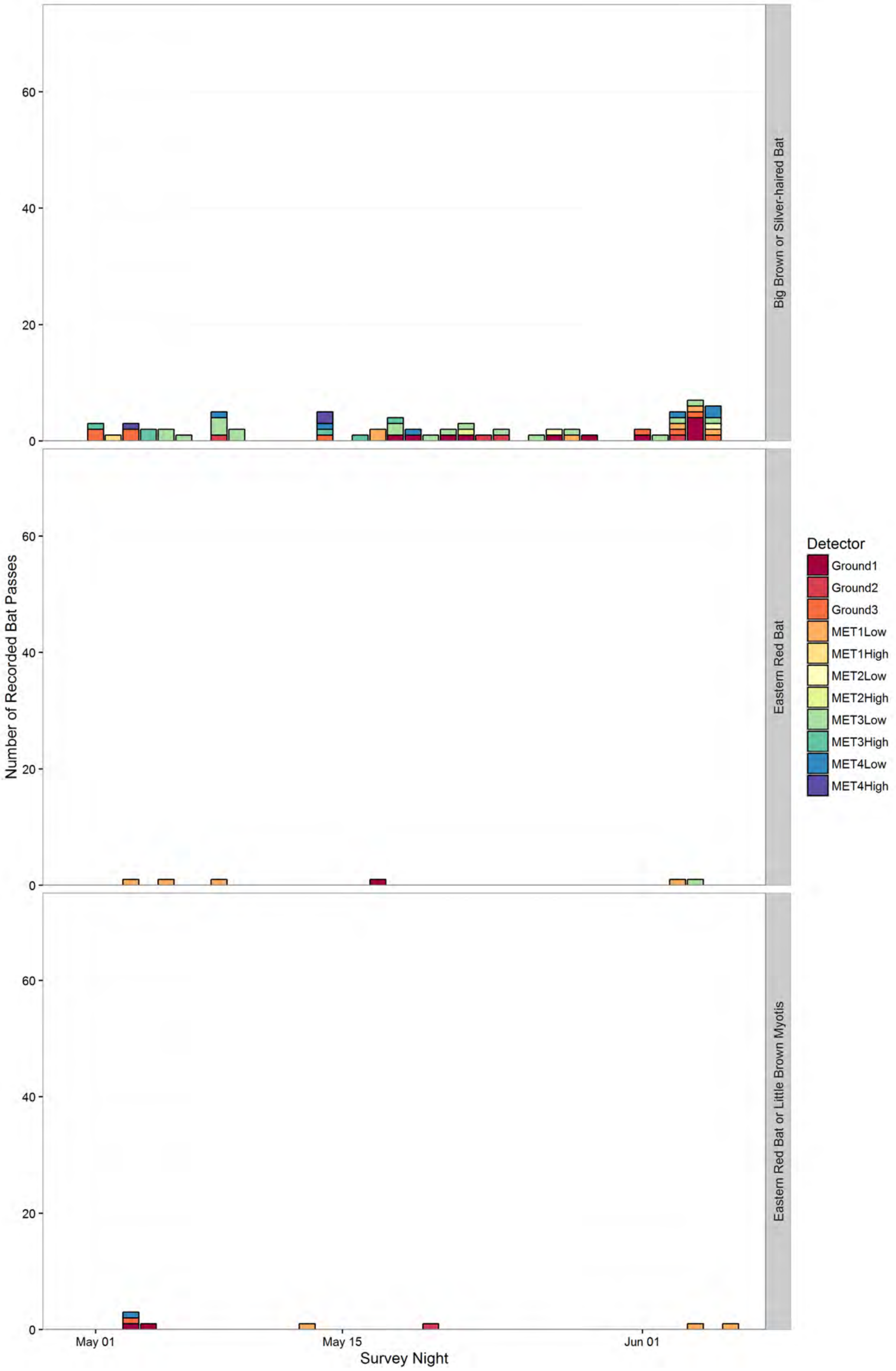

Figure B- 2 Bat Passes per Species by Detector During the 2016 Spring Monitoring Period

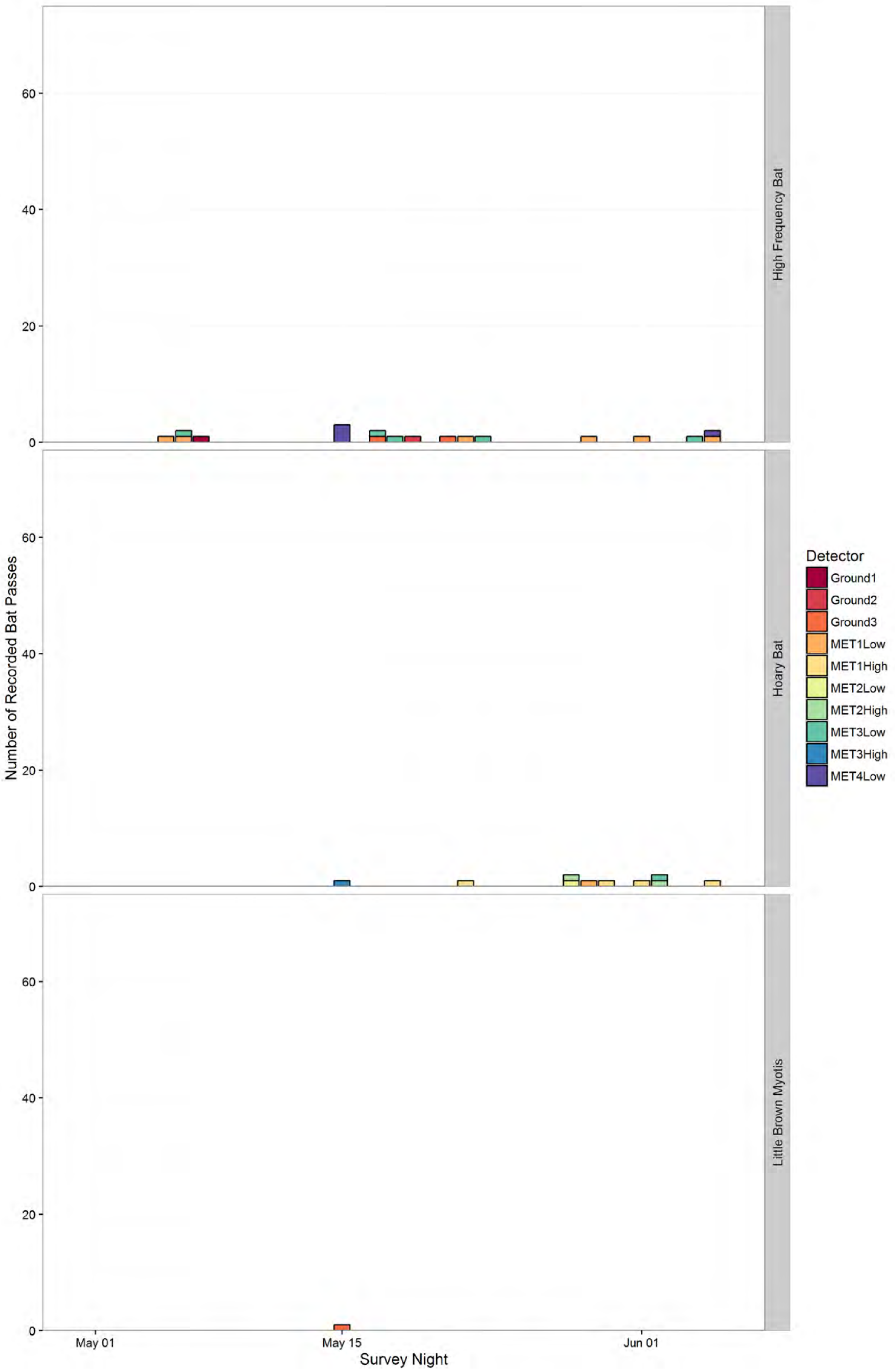

Figure B-2 (Continued)

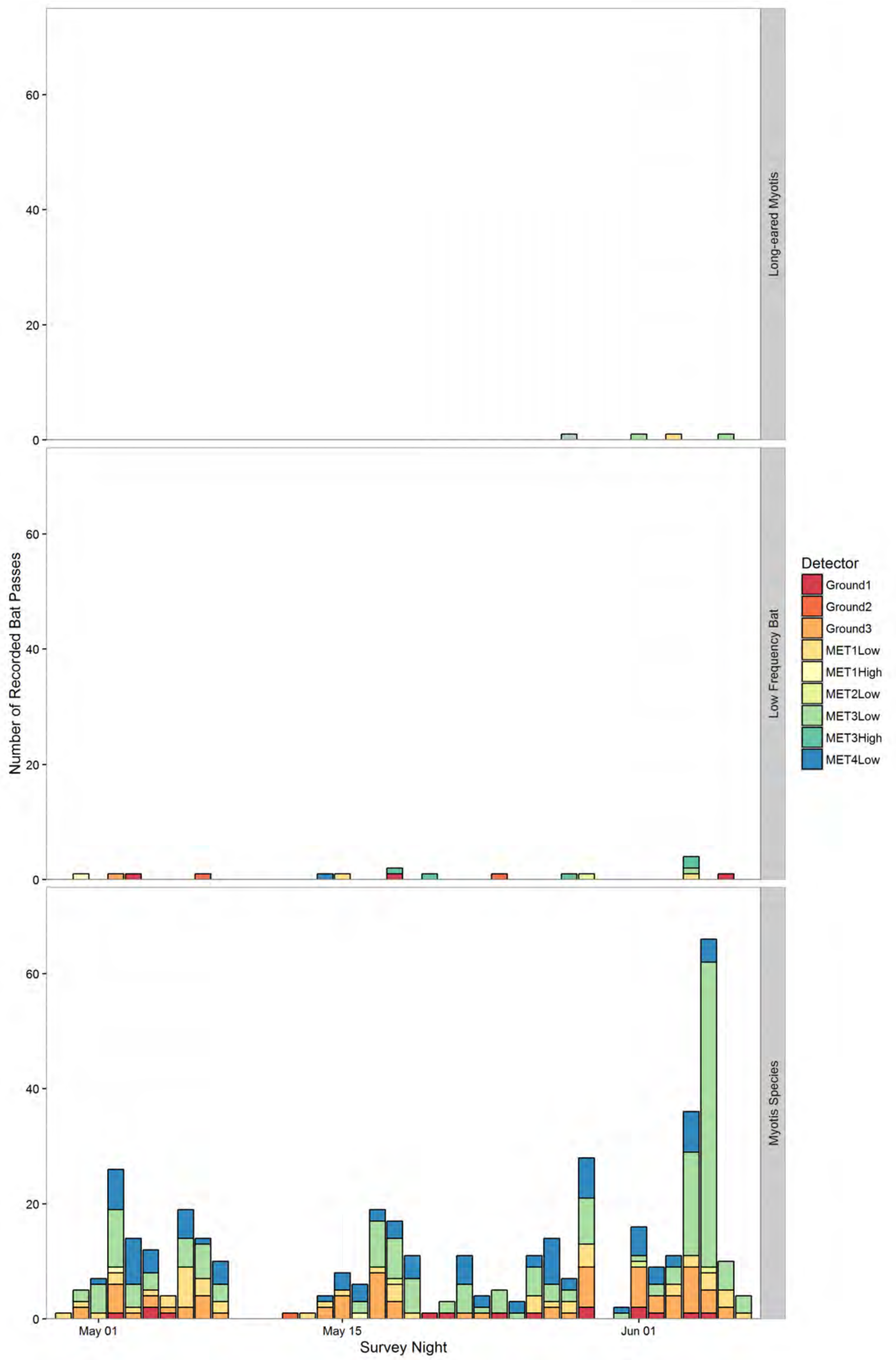

Figure B-2 (Continued)

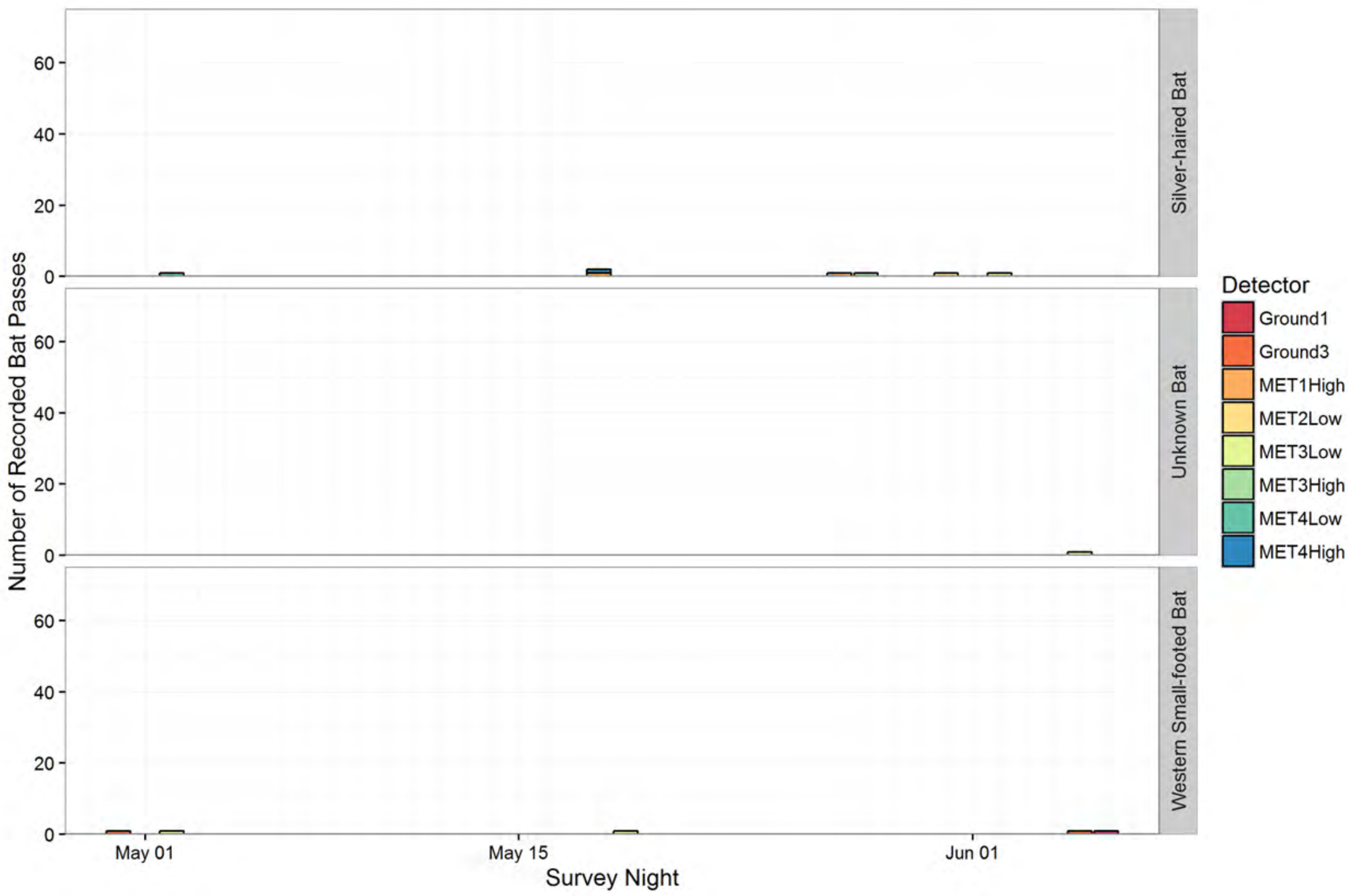

Figure B-2 (Continued)

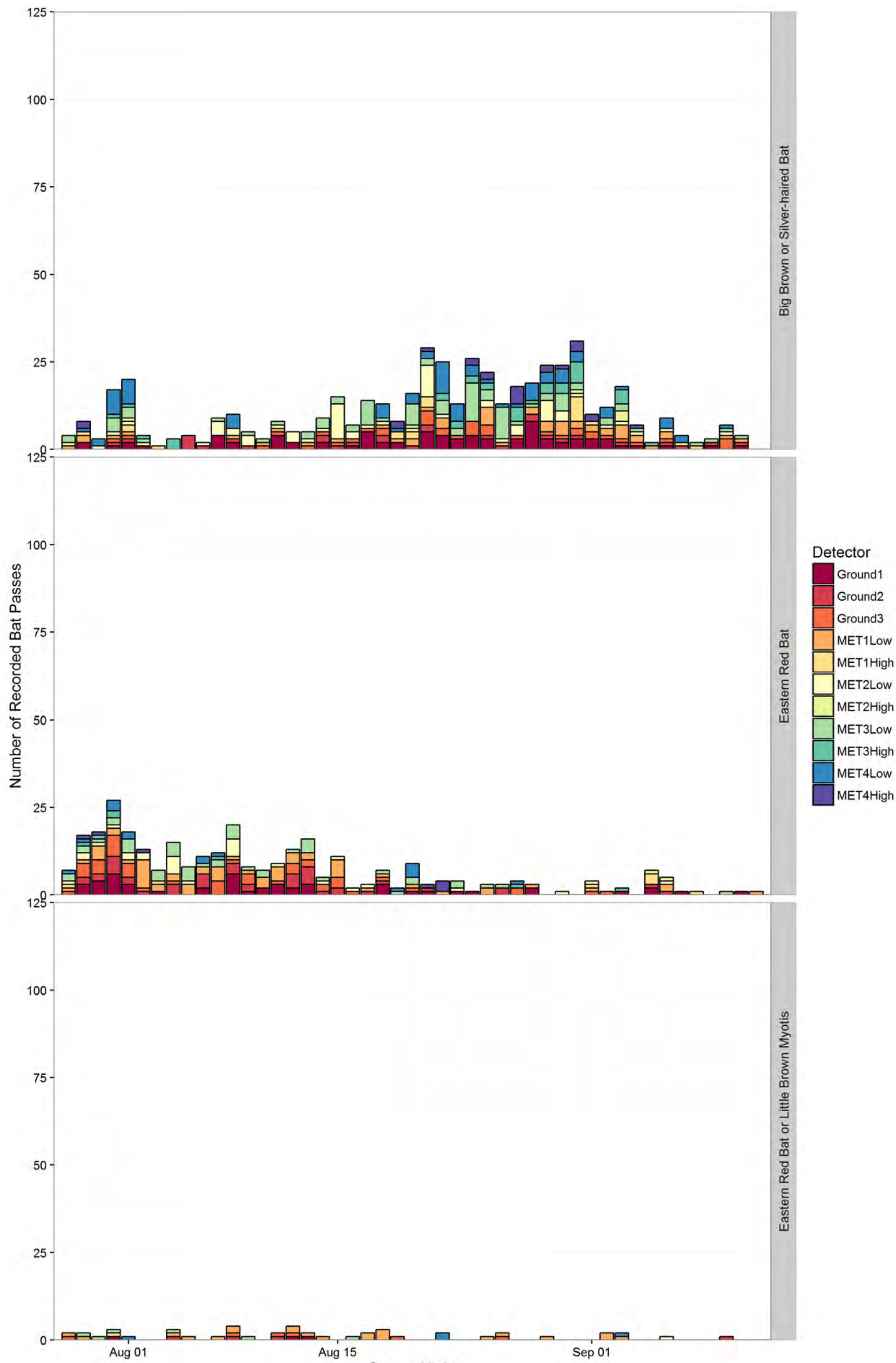

Figure B- 3 Bat Passes per Species by Detector During the 2016 Fall Monitoring Period

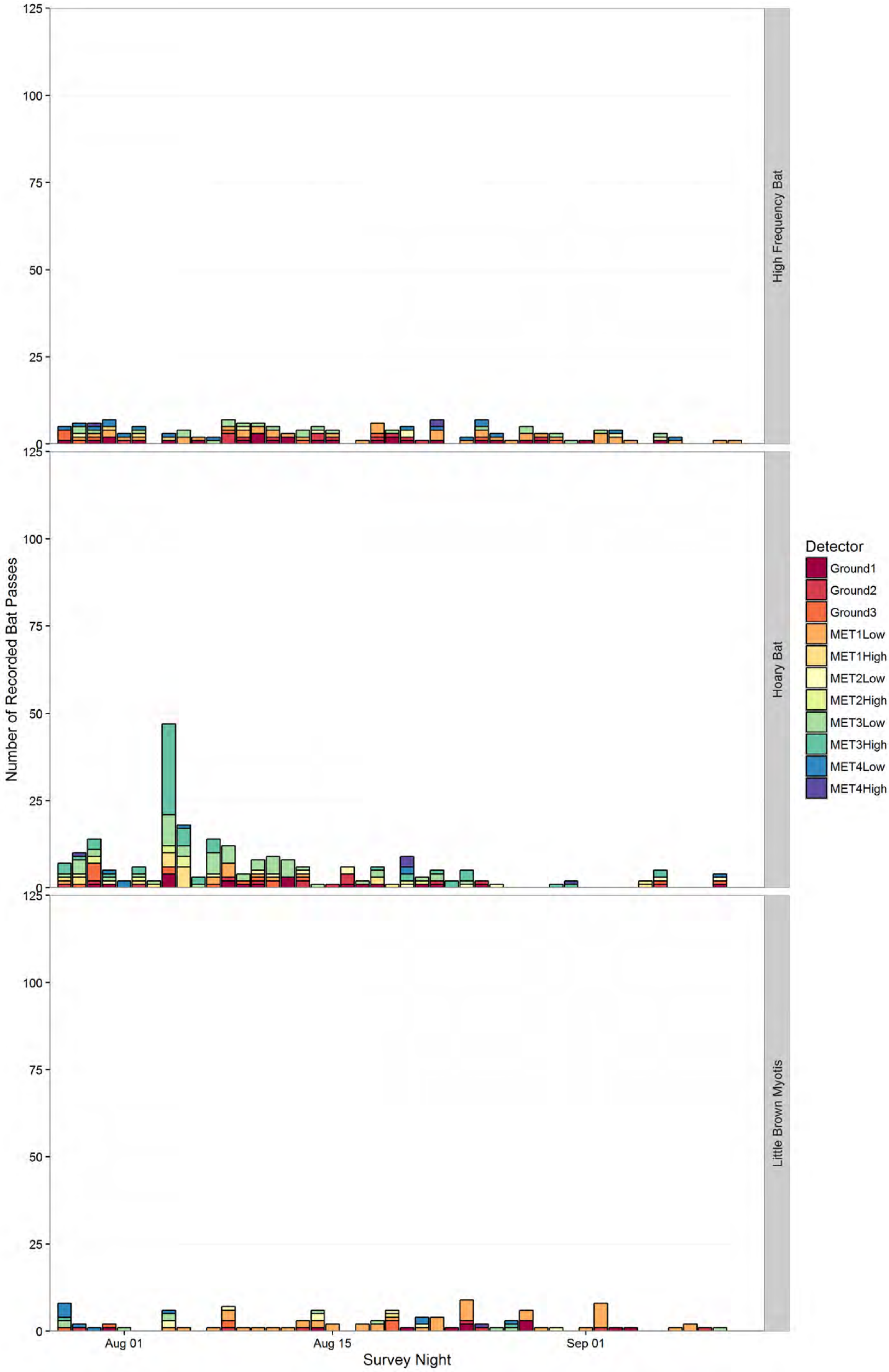

Figure B-3 (Continued)

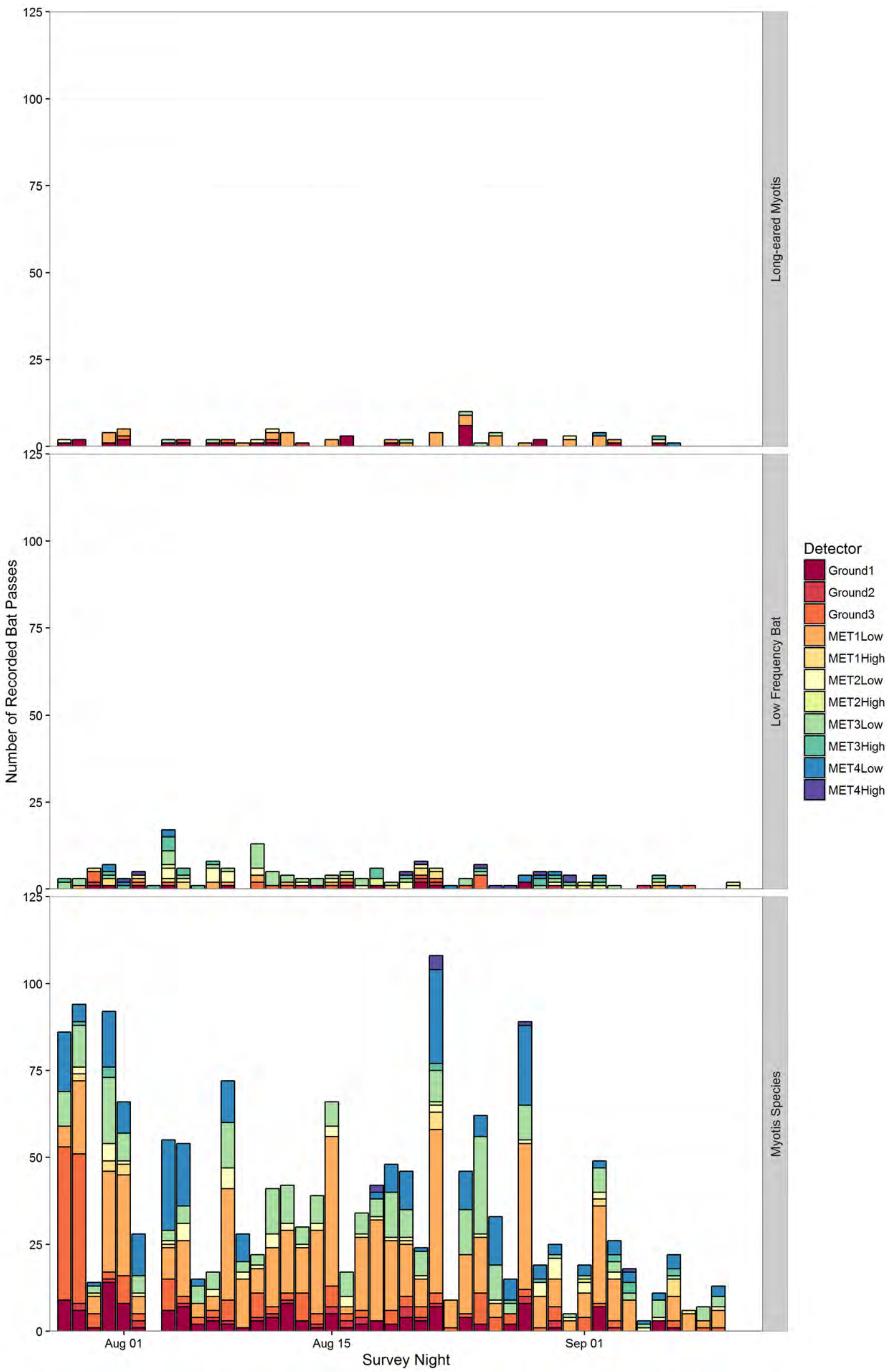

Figure B-3 (Continued)

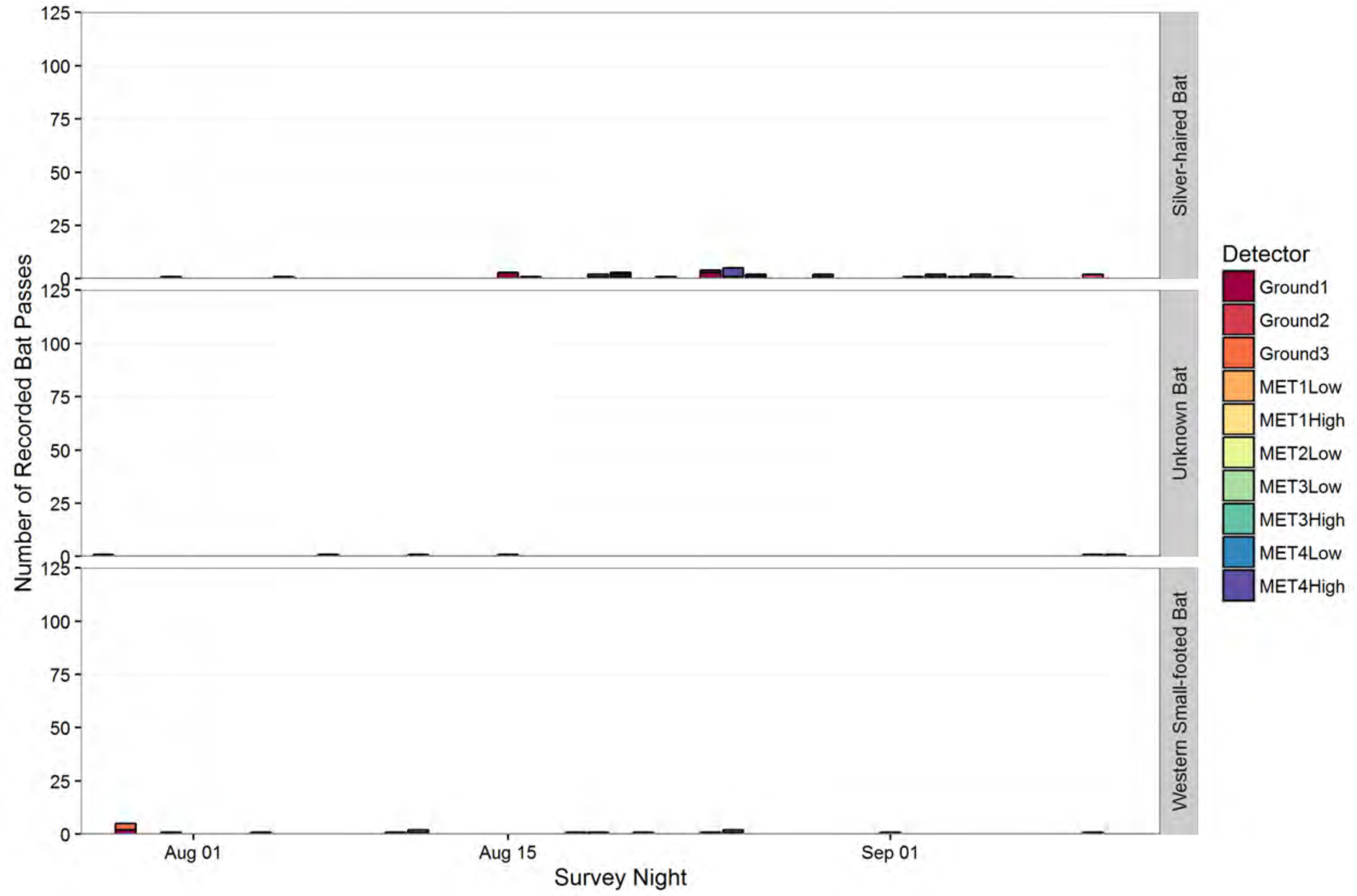

Figure B-3 (Continued)

Appendix C PHOTOS

Photo C- 1 Gentle Coulees with Native Prairie and Patches of Trees Looking South from MET 3 Station

Photo C- 2 Gentle Coulees with Native Prairie and Deciduous Forest Looking North from the top of the Big Muddy Valley at MET 3 Station.

Appendix J

Heritage Resources

J.1 Heritage Conservation Branch Referral Letter

Government
of
Saskatchewan

Ministry of Parks Culture and Sport

Heritage Conservation Branch
2nd Floor, 3211 Albert Street
Regina, Canada S4S 5W6

Phone: 306-787-5774
Tom.richards@gov.sk.ca

March 27, 2018

Our file: 18-324

ORIGINAL E-MAILED
Mar. 27/18

Ms. Lauren Stead
Stantec Consulting Ltd.
Agent for: **BluEarth Renewables Inc.**
100 – 75 24th Street E
SASKATOON SK S7K 0K3
Email: lauren.stead@stantec.com

Dear Ms. Stead:

RE: BluEarth Renewables Inc. – Outlaw Trail Wind Energy Project:
See Table 1 for 87 Locations;
HERITAGE RESOURCE REVIEW

Thank you for referring this project for heritage resource review.

In determining the need for, and scope of, Heritage Resource Impact Assessment (HRIA) pursuant to s.63 of *The Heritage Property Act*, the following factors were considered: the presence of previously recorded heritage sites, the area's overall heritage resource potential, the extent of previous land disturbance, and the scope of new proposed land development.

The proposed project is located on both cultivated land and undisturbed hummocky native prairie near seasonal water sources and drainage coulees south of the Big Muddy Valley and Castle Butte. The latter is a terrain type considered to have moderate to high potential for containing archaeological sites. Eight archaeological sites (DhNh-1, 2, 15, 16, 44, 54, 55 and 56) and one palaeontological site (72H03-0003) are in direct conflict with the development, and there are a number of sites recorded nearby including Sites of a Special Nature (SSN). As heritage resources may be adversely affected by this wind farm development, an HRIA study is required for those areas specified in Table 1.

Although one palaeontological site (72H03-0003) is within the development area, a palaeontological HRIA is not required at this time provided the site area and surrounding exposures are avoided. The palaeontological site is located in NW-2-3-25-W2M and was found within the Ravenscrag Formation exposures present here. The site consists of one almost complete crocodile-like Champsosaurus skeleton. If the exposures cannot be avoided, the palaeontologists from the Royal Saskatchewan Museum (RSM) must be contacted to assess the potential disturbance area. There are also a number of other exposure areas within the rest of the development area. If fortuitous discovery of fossils occurs (either in the planning or construction phase), then the palaeontologists at the RSM must also be contacted for assessment.

...2

The HRIA, including systematic surface survey and sub-surface test exploration, is a proponent responsibility. The study will first establish the presence of heritage sites within the project area and where suitable site avoidance measures (including right-of-way relocation) may be implemented. If heritage sites are located in unavoidable conflict with development, the study must also establish the content, structure and significance of those sites, and, on that basis, recommend both the need for and scope of any further study (including archaeological salvage excavation or other conservation action).

The HRIA must be carried out by qualified personnel under an approved investigation permit issued through this office. Normally, two days are required to process a heritage contractor's permit application.

If you have any questions regarding these heritage regulatory requirements, please contact Kim Cloutier at the above address or by calling 787-2848. Thank you again for referring this proposed development and for your cooperation in protecting the province's cultural heritage.

Sincerely,

Thomas Richards

Dr. Thomas Richards
Senior Archaeologist

cc: Kim Cloutier, Archaeologist, Heritage Conservation Branch, Ministry of Parks, Culture and Sport

Table 1: HRIA Requirements for 87 Heritage Sensitive Quarter Sections

Quarter Section	HCB Requirement(s)	HCB Comments
SW-36-02-25-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact hummocky native prairie and areas disturbed by cultivation adjacent to coulee drainages.
NW-36-02-25-W2M	**HRIA Required**	No sites in conflict. Development will impact hummocky native prairie adjacent to seasonal water sources and coulee drainages.
NW-03-03-24-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact hummocky native prairie and areas disturbed by cultivation and road infrastructure adjacent to coulee drainages and seasonal water

		sources.
SW-04-03-24-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact hummocky native prairie and areas disturbed by cultivation and road infrastructure adjacent to seasonal water sources.
NE-27-02-25-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact hummocky native prairie and areas disturbed by cultivation and an existing yard site.
SE-15-03-25-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact a small portion of native prairie along the edge of a coulee drainage and areas disturbed by cultivation.
NE-34-02-25-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact hummocky native prairie and areas disturbed by cultivation, road infrastructure and an existing yard site.
NE-32-02-24-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact hummocky native prairie and possibly areas disturbed by cultivation, adjacent to seasonal water sources and drainages.
SW-09-03-24-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact hummocky native prairie and areas disturbed by cultivation, adjacent to coulee drainages.
SW-01-03-25-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact hummocky native prairie and areas disturbed by cultivation, adjacent to seasonal water sources.
SE-11-03-24-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact hummocky native prairie and areas disturbed by cultivation, adjacent to seasonal water sources.
NE-05-03-24-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact hummocky native prairie and areas disturbed by cultivation.
NE-11-03-25-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact hummocky native prairie and possibly areas disturbed by cultivation, adjacent to seasonal water sources.
SE-08-03-24-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact hummocky native prairie and areas disturbed by cultivation, adjacent to coulee drainages.
NW-35-02-24-W2M	**HRIA Required for**	No sites in conflict. Development may impact

	native prairie portions only	hummocky native prairie and areas disturbed by cultivation, adjacent to coulee drainages.
SE-02-03-24-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact hummocky native prairie and areas disturbed by cultivation, adjacent to seasonal water sources and coulee drainages.
SE-04-03-24-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact hummocky native prairie and areas disturbed by cultivation and road infrastructure, adjacent to seasonal water sources.
NW-34-02-25-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact hummocky native prairie adjacent to coulee drainages.
SW-35-02-25-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact native prairie adjacent to seasonal water sources and areas disturbed by cultivation.
SW-02-03-24-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact hummocky native prairie adjacent to seasonal water sources and areas disturbed by cultivation and road infrastructure.
NE-10-03-25-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact hummocky native prairie and coulee drainages, and areas disturbed by cultivation.
NW-12-03-24-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact hummocky native prairie adjacent to seasonal water sources, and areas disturbed by cultivation and road infrastructure.
SE-12-03-24-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact hummocky native prairie and coulee drainages, and areas disturbed by cultivation and road infrastructure.
SW-03-03-24-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact hummocky native prairie and coulee drainages, and areas disturbed by cultivation.
NW-31-02-24-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact hummocky native prairie adjacent to seasonal water sources, and areas disturbed by cultivation.
NW-34-02-24-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact hummocky native prairie adjacent to coulee drainages, and areas disturbed by road infrastructure.

NE-31-02-24-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact hummocky native prairie adjacent to coulee drainages, and areas possibly disturbed by cultivation.
NW-09-03-25-W2M	**HRIA Required for native prairie portions**	No sites in conflict. Development may impact native prairie adjacent to coulee drainages, and areas disturbed by cultivation and road infrastructure.
NE-03-03-24-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact hummocky native prairie adjacent to seasonal water sources, and areas disturbed by cultivation and road infrastructure.
NW-09-03-24-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact native prairie adjacent to coulee drainages, and areas disturbed by cultivation.
SW-29-02-24-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact native prairie adjacent to coulee drainages, and areas disturbed by cultivation and road infrastructure.
NE-35-02-24-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact native prairie adjacent to coulee drainages, and areas disturbed by cultivation.
NW-22-03-25-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact native prairie adjacent to coulee drainages, and areas disturbed by cultivation.
NE-33-02-24-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact native prairie adjacent to seasonal water sources, and areas disturbed by gravel activities in SE corner.
SE-29-02-24-W2M	**HRIA Required**	No sites in conflict. Development will impact native prairie adjacent to coulee drainages.
SW-01-03-24-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact native prairie adjacent to seasonal water sources and coulee drainages, and areas disturbed by cultivation.
SW-33-02-24-W2M	**HRIA Required**	No sites in conflict. Development will impact native prairie adjacent to coulee drainages.
SW-12-03-24-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact native prairie adjacent to seasonal water sources, and areas disturbed by cultivation, road infrastructure and gravel activities.
NW-01-03-24-W2M	**HRIA Required for**	No sites in conflict. Development may impact

	native prairie portions only	native prairie adjacent to coulee drainages, and areas disturbed by cultivation.
SE-22-03-25-W2M	**HRIA Required**	No sites in conflict. Development will impact native prairie adjacent to coulee drainages.
SE-19-02-24-W2M	**HRIA Required**	No sites in conflict. Development will impact native prairie adjacent to coulee drainages.
NW-29-02-24-W2M	**HRIA Required**	No sites in conflict. Development will impact native prairie adjacent to coulee drainages.
NW-33-02-24-W2M	**HRIA Required**	No sites in conflict. Development will impact native prairie adjacent to coulee drainages.
NE-12-03-24-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact hummocky native prairie adjacent to coulee drainages, and areas disturbed by cultivation.
SE-03-03-24-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact hummocky native prairie adjacent to coulee drainages, and areas disturbed by cultivation.
NW-04-03-24-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact hummocky native prairie along the western boundary of the quarter section adjacent to seasonal water sources, and areas disturbed by cultivation, road infrastructure, and an existing yard site.
NW-07-03-23-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact native prairie adjacent to coulee drainages, and areas disturbed by cultivation.
SE-21-03-25-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact native prairie adjacent to a coulee drainages, and areas disturbed by cultivation and road infrastructure.
SW-32-02-24-W2M	**HRIA Required**	No sites in conflict. Development will impact hummocky native prairie adjacent to coulee drainages.
SE-11-03-25-W2M	**HRIA Required**	No sites in conflict. Development will impact hummocky native prairie adjacent to seasonal water sources.
NW-32-02-24-W2M	**HRIA Required**	No sites in conflict. Development will impact hummocky native prairie adjacent to coulee drainages.
NW-30-02-24-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact native prairie adjacent to coulee drainages, and areas disturbed by cultivation, road infrastructure and a yard site.

NE-09-03-25-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact hummocky native prairie adjacent to coulee drainages, and areas disturbed by cultivation.
NE-02-03-24-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact hummocky native prairie adjacent to seasonal water sources, and areas disturbed by cultivation.
SE-31-02-24-W2M	**HRIA Required**	No sites in conflict. Development will impact hummocky native prairie adjacent to coulee drainages.
NW-08-03-24-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact native prairie adjacent to coulee drainages, and areas disturbed by cultivation.
SW-22-03-25-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact native prairie adjacent to a coulee drainage in the NE corner, and areas disturbed by cultivation.
SW-07-03-23-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact native prairie adjacent to a coulee drainage, and areas disturbed by cultivation.
NE-04-03-24-W2M	No further concerns	No sites in conflict. Development will impact areas disturbed by cultivation and road infrastructure with minimal amounts of native prairie adjacent to seasonal water sources.
NE-18-02-24-W2M	**HRIA Required**	No sites in conflict. Development will impact native prairie adjacent to coulee drainages.
NE-01-03-25-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact native prairie adjacent to coulee drainages, and areas disturbed by cultivation.
NE-34-02-24-W2M	**HRIA Required**	No sites in conflict. Development will impact native prairie adjacent to coulee drainages.
NW-10-03-25-W2M	**HRIA Required for native prairie portions and assessment of DhNh-2**	DhNh-2 (artifact/feature combo) in conflict. Development may impact hummocky native prairie adjacent to coulee drainages, and areas disturbed by cultivation and road infrastructure.
NW-35-02-25-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact hummocky native prairie adjacent to water sources, and areas disturbed by cultivation and road infrastructure.
SE-36-02-25-W2M	**HRIA Required for native prairie**	No sites in conflict. Development may impact native prairie adjacent to coulee drainages, and

	portions only	areas disturbed by cultivation.
NE-36-02-25-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact hummocky native prairie adjacent to coulee drainages, and areas disturbed by cultivation and road infrastructure.
NE-01-03-24-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact hummocky native prairie adjacent to coulee drainages, and areas disturbed by cultivation and road infrastructure.
NE-08-03-24-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact hummocky native prairie adjacent to coulee drainages, and areas disturbed by cultivation.
NW-02-03-25-W2M	**HRIA Required for native prairie portions only and avoidance of exposures around site 72H03-0003 recommended**	One palaeontology site (72H03-0003) in conflict. Development may impact hummocky native prairie adjacent to coulee drainages, and areas disturbed by cultivation. Avoid exposures of Ravenscrag Formation. If avoidance of exposures is not feasible, a palaeontology HRIA may be required.
SE-35-02-25-W2M	**HRIA Required**	No sites in conflict. Development will impact hummocky native prairie adjacent to coulee drainages.
NE-15-03-25-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact native prairie adjacent to a coulee drainage, and areas disturbed by cultivation.
SE-09-03-24-W2M	**HRIA Required for native prairie portions and assessments of DhNh-1, 15, and 16**	DhNh-1 (artifact/feature combo), DhNh-15 (single feature), and DhNh-16 (recurrent feature) in conflict. Development may impact hummocky native prairie adjacent to coulee drainages, and areas disturbed by cultivation.
NW-26-02-25-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact native prairie adjacent to a drainage, and areas disturbed by cultivation.
SE-05-03-24-W2M	**HRIA Required if potential impact to DhNh-55**	DhNh-54 (artifact find), DhNh-55 (single feature) and DhNh-56 (artifact find) are in conflict, but DhNh-54 and 56 have no further work recommended. Development may impact native prairie adjacent to coulee drainages, and areas disturbed by cultivation and road infrastructure. This entire quarter section was previously surveyed (permit 17-197).
NW-15-03-25-W2M	**HRIA Required for**	DhNh-44 (recurrent feature) in conflict.

	assessment of DhNh-44	Development will impact areas disturbed by cultivation.
NE-21-03-25-W2M	No further concerns	No sites in conflict. Development will impact areas disturbed by cultivation with only a small amount of native prairie within the drainage coulee.
NW-01-03-25-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact native prairie adjacent to water sources, and areas disturbed by cultivation.
NW-12-03-25-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact native prairie adjacent to drainage coulees, and areas disturbed by cultivation.
NE-22-02-25-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact native prairie and areas disturbed by cultivation.
SW-31-02-24-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact native prairie adjacent to seasonal water sources, and areas disturbed by cultivation.
SE-34-02-24-W2M	**HRIA Required**	No sites in conflict. Development will impact native prairie adjacent to drainage coulees.
SE-01-03-24-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact native prairie adjacent to drainage coulees, and areas disturbed by cultivation and road infrastructure.
SE-32-02-24-W2M	**HRIA Required**	No sites in conflict. Development will impact native prairie adjacent to drainage coulees.
NW-11-03-25-W2M	**HRIA Required**	No sites in conflict. Development will impact native prairie adjacent to seasonal water sources and a drainage coulee.
SW-02-03-25-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact native prairie adjacent to a drainage coulee, and areas disturbed by cultivation and road infrastructure.
SW-11-03-24-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact areas disturbed by cultivation with only a small portion of native prairie in the SW corner.
NW-07-03-24-W2M	**HRIA Required for native prairie portions only**	No sites in conflict. Development may impact native prairie adjacent to drainage coulees, and areas disturbed by cultivation.

J.2 Heritage Resource Impact Assessment Report

atlheritage
SERVICES CORP

OUTLAW TRAIL WIND LIMITED PARTNERSHIP
c/o BluEarth Renewables Inc.

Outlaw Trail Wind Project
Heritage Resources Impact Assessment

Permit No.	20-114
HCB File No.:	20-247
Atlheritage File No.	AH20014-2

Atlheritage Services Corp.
150 – 203 Packham Avenue
Saskatoon, SK
S7N 4K5
o. (306) 242-2822

EXECUTIVE SUMMARY

The Outlaw Trail Wind Limited Partnership (Outlaw Trail LP) is proposing to develop a wind power project known as the Outlaw Trail Wind Project in south-central Saskatchewan on the south side of the Big Muddy Valley (Figure 1). A Heritage Resources Impact Assessment (HRIA) was completed for the Outlaw Trail Wind Project under Archaeological Resources Investigation Permit No. 20-018. Following the HRIA, The Outlaw Trail Wind Project was revised to include underground collector lines, which resulted in several new right-of-way's (ROW) that were not part of the original Heritage Resource Review and HRIA. Atlheritage Services Corp. (Atlheritage) submitted the revised plans, heritage concerns (i.e. areas of native prairie) to the Heritage Conservation Branch (HCB) and Archaeological Resource Investigation Permit No. 20-114 was issued.

Atlheritage completed the new HRIA requirements under Archaeological Resource Investigation Permit No. 20-114 on September 30, 2020. No new archaeological sites were discovered in conflict. In addition, archaeological sites DhNh-57 and DhNh-58 that were discovered during the original HRIA (Permit No. 20-018) are no longer in conflict with the Outlaw Trail Wind Project.

Based on the results of the HRIA, it is recommended that Outlaw Trail LP be provided with regulatory approval as per Section 63 of *The Heritage Property Act* for the Outlaw Trail Wind Project (HCB File No. 20-247). The following HRIA Permit Report fulfills the permit requirements for Permit No. 20-114.

PROJECT CREDITS

Project Manager	……………………………………………………Mike Markowski, M.A.
Permit Holder	……………………………………………………Mike Markowski, M.A.
Field Assistant	……………………………………..Paul Thomson, B.A., M.A. Candidate
Report Author	……………………………………………………Mike Markowski, M.A.
Senior Review	……………………………………………………Brad Schiele, M.A.

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APPENDICES

1.0 INTRODUCTION

The Heritage Conservation Branch (HCB) reviewed the Outlaw Trail Wind Project for heritage concerns (HCB File No. 20-247). The HCB identified several areas where Project components (i.e. collector lines and access roads) will impact areas of native prairie near seasonal water sources and drainage coulees south of the Big Muddy Valley – terrain considered to have moderate to high potential to discover intact archaeological sites. Atlheritage Services Corp. (Atlheritage) completed the Heritage Resources Impact Assessment (HRIA) requirements under Archaeological Resource Investigation Permit No. 20-018. Archaeological sites DhNh-57 and DhNh-58 were discovered in conflict with collector line right-of-way's (ROW).

Following the HRIA, The Outlaw Trail Wind Project was revised to include underground collector lines, which resulted in several new right-of-way's (ROW) through areas of native prairie that were not assessed during the original HRIA. Atlheritage submitted the revised plans and heritage concerns (i.e. areas of native prairie) to the HCB. The HCB agreed with Atlheritage's recommendations and issued Archaeological Resource Investigation Permit No. 20-114.

Atlheritage completed the new HRIA requirements under Archaeological Resource Investigation Permit No. 20-114 on September 30, 2020. No new archaeological sites were discovered in conflict. In addition, archaeological sites DhNh-57 and DhNh-58 that were discovered during the original HRIA (Permit No. 20-018) are no longer in conflict with the Outlaw Trail Wind Project.

This report documents the results of the HRIA. The HCB's Heritage Resource Review and HRIA requirements are addressed in Section 2.0, a description of the Project and local environment is discussed in Section 3.0. A general discussion regarding the methodology used to complete the HRIA requirements are reviewed in Section 4.0. The results of the HRIA are included in Section 5.0. A summary of the HRIA and recommendations are found in Section 6.0

and closure to the HRIA is in Section 7.0. All references cited in this report are presented in Section 9.0. Excavated shovel probe locations are documented in Appendix A. At this time, there are no formal survey plans available since all data (i.e. collector lines, turbine locations, access road) were provided using .shp files. For the Project layout/footprint, please refer to Figures 1, 2A and 2B.

2.0 HERITAGE RESOURCE REVIEW

The Heritage Property Act (Part III and IV, s.59, s.63, s.66) outlines the key provisions for protecting heritage resources in Saskatchewan. The legislation states that heritage resources include Precontact Period and Historic Period archaeological sites, built heritage sites and structures of historical and/or architectural interest and palaeontological sites. Heritage Resources are regarded as a public resource; however, all heritage resources (e.g. artifacts) are the property of the Provincial Crown and are protected under *The Heritage Property Act (s.66).* Any person or corporation who contravenes any provision of *The Heritage Property Act* is guilty of an offence and liable on summary conviction of a fine, imprisonment, or both.

The HCB's (Government of Saskatchewan – Parks, Culture and Sport), Archaeological Resource Management Section focuses on land and resource development review, HRIAs, permitting, managing the Saskatchewan Archaeological Site Inventory, and geographic place naming. To streamline the Heritage Resource Review process, the HCB has developed screening criteria for identifying archaeologically sensitive lands in Saskatchewan.

For any proposed land use or development project, the HCB relies on two primary factors to determine if the land use or development project will trigger an HRIA as per s.63 of *The Heritage Property Act*:

- The presence of previously recorded archaeological sites.
- The heritage resource potential (or sensitivity) of the development area.

Important secondary factors include:

- The nature and extent of previous land disturbance (including cultivation).
- The nature and scope of new land alteration.

This information is taken into consideration with additional screening criteria developed specifically for southern Saskatchewan (grasslands, southern parklands); and, northern Saskatchewan (northern parklands, boreal forest).

2.1 Outlaw Trail Wind Project

The original Project footprint for the proposed Outlaw Trail Wind Project was reviewed HCB for heritage concerns under HCB File No. 18-324; however, a HRIA was never completed since the Project footprint was not defined. In 2020, Atlheritage submitted a subsequent Heritage Resource Review with defined turbine locations, collector lines and access roads to determine HRIA requirements. The HCB noted that the Project will impact both cultivated land and areas of native prairie near seasonal water sources and drainage coulees south of the Big Muddy Valley (HCB File No. 20-247). Based on the heritage concerns identified, the HCB required a HRIA for all areas of native prairie that will be impacted by Project infrastructure (HCB File No. 20-247) (Atlheritage 2020).

Following the completion of the HRIA requirements under Permit No. 20-018 (Atlheritage 2020), the Outlaw Trail Wind Project was further revised (Figures 1; 2A and 2B). Specifically, collector line ROWs were revised (from overhead to underground), which impacted routing. Atlheritage reviewed the revised Project footprint and identified areas with heritage concerns (i.e. areas of native prairie) and discussed their recommendations with the HCB. A HRIA was recommended for collector line ROWs that will impact areas of native prairie in the quarter-sections included in Table 1 (Figures 1; 2A and 2B). All collector lines adjacent to existing gravel roads will be installed in the ditches, which have been impacted by RM road construction.

Table 1: Heritage Concerns Identified in the Revised Outlaw Trail Wind Project

Quarter-section	*HRIA Recommendations*
NE 9-3-25 W2M	Collector line ROW in areas of native prairie (~270 m of ROW).
NW 10-3-25 W2M	Collector line ROW in areas of native prairie; hills (~400 m)
NE 1-3-25 W2M	Collector line ROW in areas of native prairie; hills (~385 m)
SE 8-3-24 W2M	Collector line ROW in areas of native prairie; hills (~485 m)
SW and SE 4-3-24 W2M	Collector line ROW in areas of native prairie (~1,200 m)
SW 3-3-24 W2M	Collector line ROW in areas of native prairie; creek (~540 m)
SW 2-3-24 W2M	Collector line ROW in areas of native prairie; creek (~530 m)

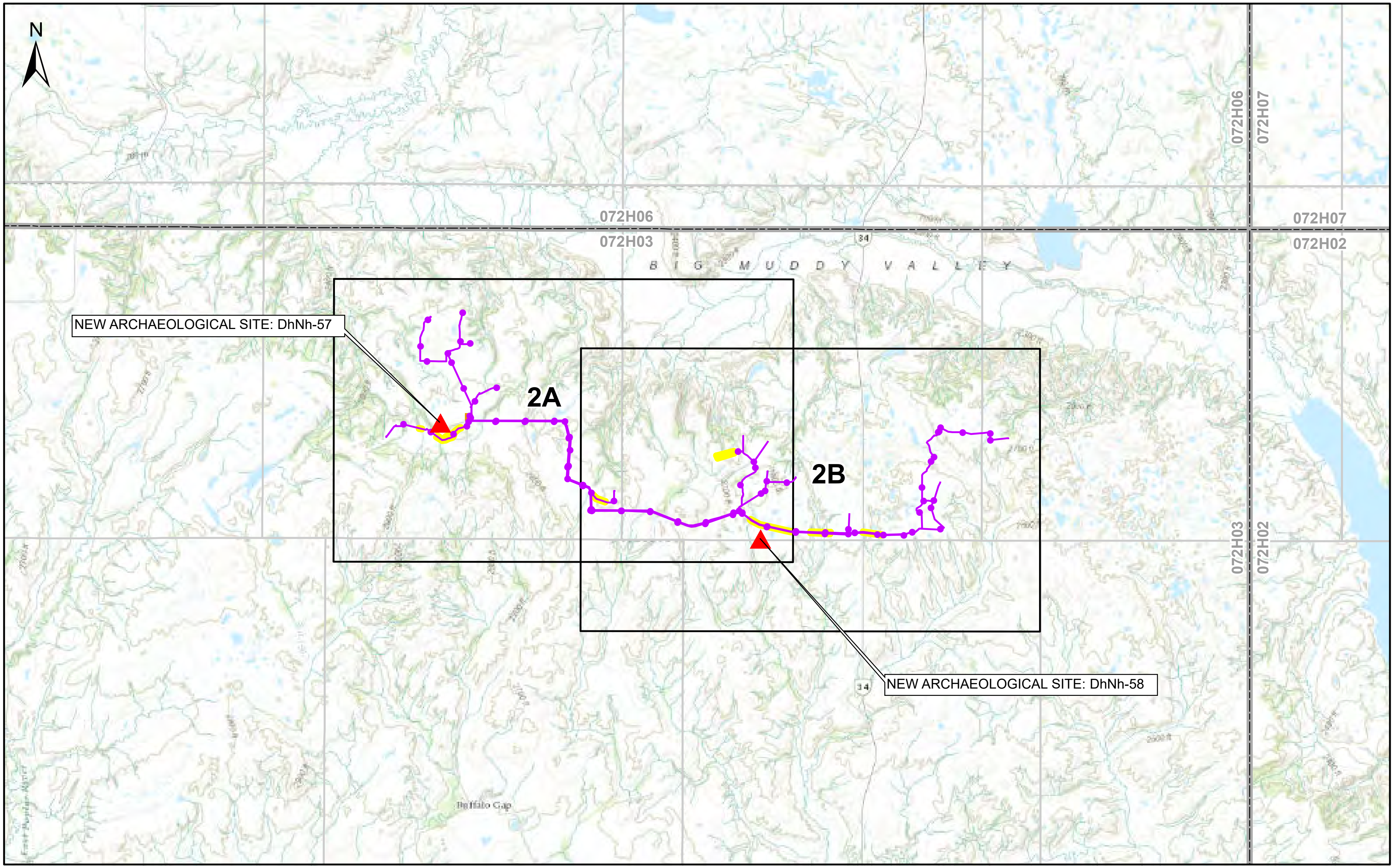
3.0 PROJECT DESCRIPTION AND LOCAL ENVIRONMENT

The Outlaw Trail Wind Project is located in the Mixed Grasslands Ecoregion in south-central Saskatchewan (Acton et al. 1998) (Figure 1). The Project area is located approximately 10 km north of Big Beaver, SK and immediately south of the Big Muddy Valley (Figure 1).

3.1 Outlaw Trail Wind Project

The Outlaw Trail Wind Project covers an approximate 10 km (north/south) by 20 km (east/west) area (Figures 1; 2A and 2B). The Project currently consists of 55 proposed turbine locations (Figures 1; 2A and 2B). Access roads will be required to access the turbines and power will be distributed through a series of underground collector lines (Figures 1, 2A and 2B).

The Project will impact a combination of previously disturbed terrain (e.g. cultivated fields, ditches) and areas of native prairie. Areas of native prairie are primarily found on rolling terrain characterized by poor soil development and glacial till (surface cobbles and small boulders). Areas of native prairie primarily consists of short native grasses and are often near seasonal water sources and watercourses. Aspen, willow, and wild rose are commonly found in low-lying areas adjacent to water sources. The Big Muddy Valley is located approximately 2 km north of the northern extent of the Project area, which also includes the well-known landscape marker known as Castle Butte (Figures 1, 2A and 2B).



NOVEMBER 2020

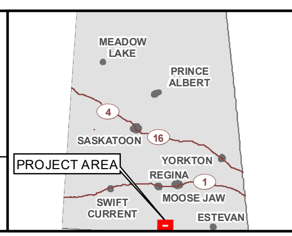
AH20014

SCALE: 1:150,000

0 2 4 6 8

Kilometers

(ALL LOCATIONS APPROXIMATE)



New Archaeological Site

Underground Collector

Overview Figure Index

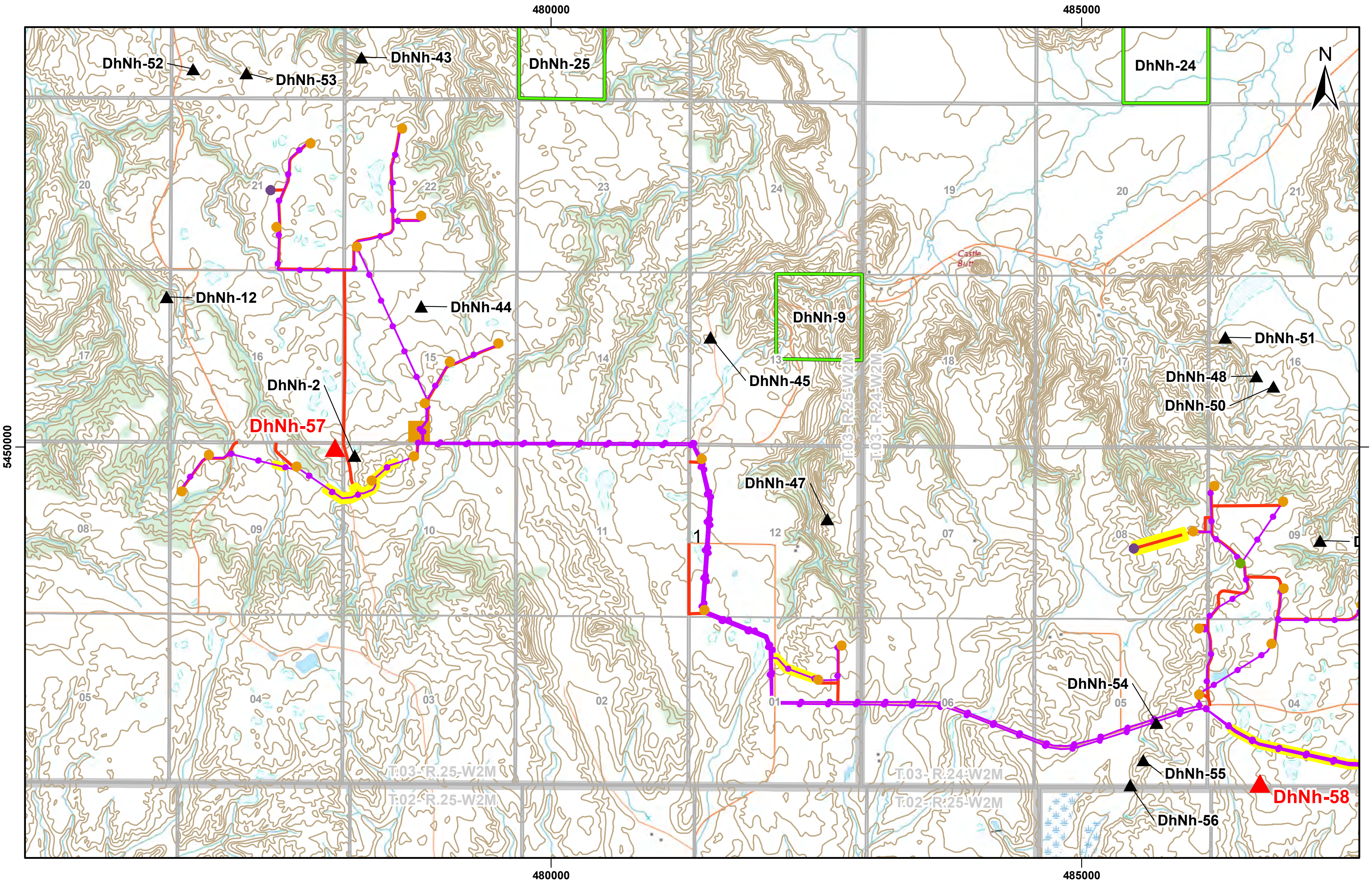
Area Assessed

Projection: NAD 1983 UTM Zone 13N . Data Sources: Information Services Corporation, 2020, Geobase 2020. Image Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community.

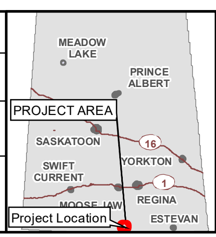
REGIONAL OVERVIEW

HRIA FOR
OUTLAW TRAIL WIND PROJECT
(PERMIT NO. 20-114)

FIGURE 1



NOVEMBER 2020			**OVERVIEW MAP**
AH20014			HRIA FOR OUTLAW TRAIL WIND PROJECT (PERMIT NO. 20-114)
SCALE: 1:50,000			
0 0.5 1 Kilometres (ALL LOCATIONS APPROXIMATE)			FIGURE 2A



- New Archaeological Site
- Known Heritage Resource
- Area Assessed
- Known Heritage Resource Area
- Junction Box
- Met Tower
- OLT WTG Location
- Underground Collector
- Road
- Contour
- OLT Sub Location

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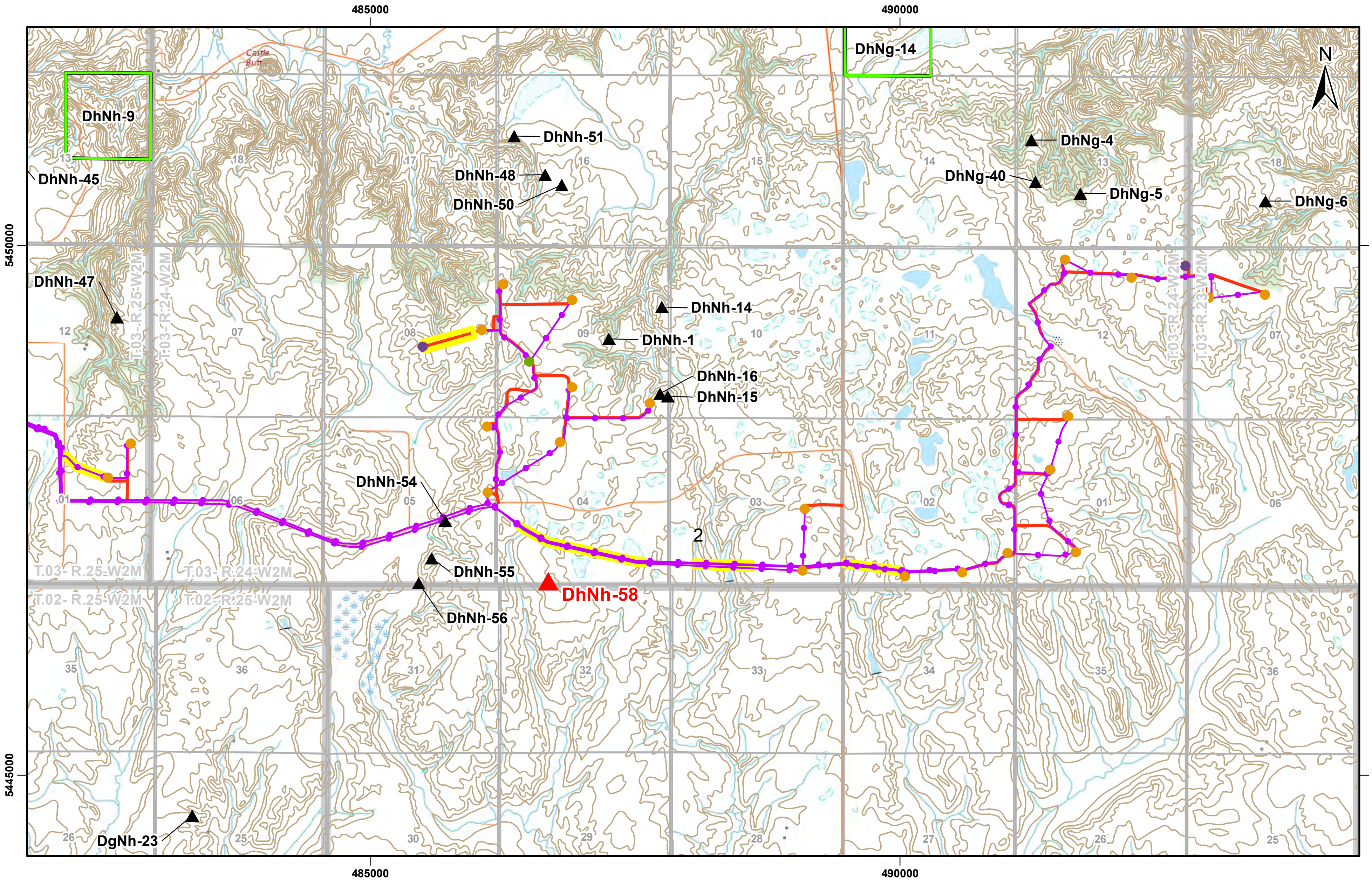
Projection: NAD 1983 UTM Zone 13N . NTS Map Sheet 72 H/03.
Data Sources: Toporama, 2020. Information Services Corporation, 2020. Canvec, 2020.



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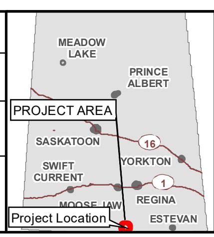
SCALE: 1:50,000
0 0.5 1 Kilometres (ALL LOCATIONS APPROXIMATE)



- New Archaeological Site
- Known Heritage Resource
- Area Assessed
- Known Heritage Resource Area
- Junction Box
- Met Tower
- OLT WTG Location
- Underground Collector
- Road
- Contour
- OLT Sub Location

Projection: NAD 1983 UTM Zone 13N . NTS Map Sheet 72 H/03.
Data Sources: Toporama, 2020. Information Services Corporation, 2020. Canvec, 2020.

OVERVIEW MAP

HRIA FOR
OUTLAW TRAIL WIND PROJECT
(PERMIT NO. 20-114)

FIGURE 2B

4.0 METHODOLOGY

Effective methodology is essential for completing an HRIA. An understanding of the general archaeology and previous archaeological research (including information on known archaeological sites) provides the archaeologist with important background information. This information may increase archaeological site discovery, interpretation of archaeological sites and the overall effectiveness of the field assessment. In addition, standard field assessment methodology and good judgement allows the archaeologist to adequately assess the project area during the field assessment.

4.1 Previous Archaeological Research

The HCB's Saskatchewan Archaeological Site Inventory was reviewed for information regarding the types of archaeological sites recorded in the project area. Typically, Saskatchewan Archaeological Resource Record (SARR) and SARR Update forms are requested for all previously recorded archaeological sites within a 1 km radius of the project area. In addition, previously completed permit reports are available on request. These reports often contain important information that is not typically included in the SARR or SARR Update forms.

Known heritage resources were reviewed within a 1 km radius of the Outlaw Trail Wind Project (NTS Map Sheet: 72 H/03). A total of 17 known heritage resources (archaeological sites) have been recorded in this area and are included in Table 2 and illustrated on Figures 2A and 2B. Archaeological site types include: Single Features (n=6), Recurrent Features (n=6), Artifact/Feature Combinations (n=2), Artifact Finds (n=2) and a Multiple Feature (n-1) (Table 2). All of the known archaeological sites within 1 km of the Project area date to the Precontact Period. The majority of these sites lack any diagnostic artifacts (e.g. projectile points, pottery) to indicate temporal age and cultural affiliation; however, a diagnostic artifact from archaeological site DhNh-1 provides evidence that this site was occupied during the Late Precontact Period. In southern Saskatchewan, the Late Precontact Period ranges from approximately 2,000 years before present (BP) to 170 years BP (Peck 2011; Walker 1999; Dyck 1983) (Figure 2B). Archaeological site DhNh-57 consists of the remains of a European Homestead from the Historic Period that likely dates to c. 1918 (Figures 1 and 2A) (Atlheritage 2020).

Table 2: Known Heritage Resources within a 1 km radius of the Outlaw Trail Wind Project

Borden No.	*Site Type*	*Period*	*Permit No.*
DhNg-5	Recurrent Feature	Precontact	90-028:00
DhNg-6	Recurrent Feature	Precontact	90-028:00
DhNg-40	Single Feature	Precontact	97-000:00
DhNh-1	Artifact/Feature Combination	Late Precontact	60-000:00
DhNh-2	Artifact/Feature Combination	Precontact	62-000:00
DhNh-12	Single Feature	Precontact	87-000:00
DhNh-14	Single Feature	Precontact	89-015:00
DhNh-15	Single Feature	Precontact	89-015:00
DhNh-16	Recurrent Feature	Precontact	89-015:00
DhNh-44	Recurrent Feature	Precontact	97-000:00
DhNh-45	Recurrent Feature	Precontact	97-000:00
DhNh-47	Single Feature	Precontact	97-000:00
DhNh-54	Artifact Find	Precontact	17-197:00
DhNh-55	Single Feature	Precontact	17-197:00
DhNh-56	Artifact Find	Precontact	17-197:00
DhNh-57	Multiple Feature	Historic (European)	20-018:00
DhNh-58	Recurrent Feature	Precontact	20-018:00

Archaeological sites DhNh-57 and DhNh-58 were discovered during the original HRIA for the Outlaw Trail Wind Project (Atlheritage 2020). These sites were discovered in conflict with collector line ROWs and required further mitigation (i.e. avoidance). The remains of a European Homestead dating to c. 1918 was discovered at DhNh-57 and 3 stone circles were recorded at DhNh-58.

The revised footprint of the Outlaw Trail Wind Project will no longer impact DhNh-57, DhNh-58 and DhNh-56 (Figures 1; 2A and 2B). Archaeological site DhNh-56 was discovered during a HRIA in 2017 and was determined to have low interpretive and scientific value (Atlheritage 2020). Therefore, there are no further heritage concerns (i.e. mitigation requirements) with the current footprint of the Outlaw Trail Wind Project.

4.2 Field Assessment

The purpose of the field assessment is to determine if heritage resources are in conflict with the proposed Project. Field assessment methodology generally consists of a combination of pedestrian reconnaissance and the excavation of subsurface shovel probes (Saskatchewan Ministry of Tourism, Parks, Culture and Sport 2008; Burke and Smith 2004; Ruppel 1966). Pedestrian reconnaissance allows the archaeologist to identify surface features (e.g. stone circles, stone cairns, cellar depressions), artifacts exposed on the surface, inspect subsurface exposures (e.g. tree throws, trails, cut-banks) and to identify areas considered to have high heritage potential.

Surface visibility can vary from excellent (e.g. short native grasses, cultivated field) to poor (e.g. tall grasses, organic deposits observed in treed environments) depending on topography, location and time of year (e.g. winter conditions – snow covered). Despite the level of surface visibility, artifacts and features may be buried due to erosional factors (e.g. wind and water) and soil deposition throughout the last 10,500 years (Schiffer et al. 1978). For this reason, it is almost always necessary to compliment pedestrian reconnaissance with the excavation of shovel probes within the project area. This is especially vital in areas with poor surface visibility, such as those covered by thick vegetation (e.g. trees, shrubs, tall grasses) or in areas in proximity to known archaeological sites (Chartkoff 1978; Lovis 1976).

Shovel probes typically measure 40 cm by 40 cm and are excavated until subsoil or glacial till is encountered which can range in depth from 5 cm depth below surface (DBS) to 60 cm DBS. In areas where greater deposition has occurred (e.g. sand dune terrain, valleys), heavy equipment may be necessary to determine if deeply buried archaeological sites are present. In general, the likelihood of discovering a small site and buried artifacts is improved when the frequency of shovel probes is increased (McManamon 1984; Meyer 1983).

If an archaeological site is discovered, the location, size, boundaries, function, and significance of the site are determined through the excavation of shovel tests and pedestrian reconnaissance (Burke and Smith 2004; Fladmark 1978). Atlheritage bases the archaeological site's geographical location (UTM coordinates NAD 83) off a central location (if multiple features and/or artifacts are discovered) using a feature (e.g. stone circle, stone cairn) or the location where the artifact was discovered. An archaeological site's UTM coordinates are recorded using a hand-held Global Positioning Satellite (GPS) unit. Instead of shovel probes, which are used for site discovery, shovel tests measuring 50 cm by 50 cm are systematically excavated to determine the extent of the site. All excavated soils are screened through a quarter-inch (6 mm) wire mesh, increasing the recovery rate of artifacts.

If artifacts are discovered on the surface during an HRIA and are not identified as a tool (e.g. lithic debitage), they are recorded and left in-situ. All artifacts discovered in-situ (e.g. in a shovel probe or shovel test) are collected. Surface and/or buried features that are discovered in conflict during the HRIA are typically tested, photographed, and mapped in detail. If the archaeological site (including cultural materials and/or features) is considered significant, or if the site is located immediately adjacent to the project area, the site or features nearest to the project area may be staked and flagged using surveyor lathe and hazard identification flagging tape for avoidance.

Artifacts collected during the HRIA will be further analyzed by Atlheritage. All collected artifacts will be catalogued and prepared according to the Royal Saskatchewan Museum's (RSM) requirements and are required to be submitted to the RSM by December 31, 2020. An artifact catalogue and photographs of all significant artifacts (e.g. stone tools, maker's marks) will be documented and discussed in the report.

5.0 FIELDWORK RESULTS

Atlheritage completed the HRIA requirements for Outlaw Trail Wind LP's Outlaw Trail Wind Project under Archaeological Resource Investigation Permit No. 20-114. Atlheritage completed the field assessment on September 30, 2020. The results of the HRIA are discussed below.

5.1 Outlaw Trail Wind Project

The Outlaw Trail Wind Project was assessed using a combination of pedestrian reconnaissance and the excavation of shovel probes (Figures 2A and 2B; Figures 3A to 3G); Appendix A). Pedestrian reconnaissance transects were completed within all of collector line ROWs that required a HRIA (3.8 km assessed). Based on the HRIA requirements and the archaeological potential of the Project, pedestrian reconnaissance transects were completed in a 25 m wide ROW for all collector line ROWs. While the actual ROWs will be much smaller than the assessed 25 m wide ROWs – the additional areas that were assessed allowed for any archaeological sites adjacent to the collector lines and access road ROWs to be identified and recorded in the event additional workspace or the actual ROWs need to be slightly moved.

A total of 47 shovel probes were excavated within the assessed collector line ROWs that will impact areas of native prairie (Figures 2A and 2B; Figures 3A to 3G); Appendix A). Shovel probes were generally excavated in 70 m to 100 m intervals in areas of native prairie in order to provide an adequate sampling of the area to determine if any buried features or artifacts are in conflict. In addition, shovel probes were also excavated in areas determined to have high archaeological potential including, hill tops and small saddle-type landforms – a common place where Precontact Period activity areas (e.g. processing areas, stone tool making) are often discovered.

All shovel probes were excavated until subsoils were encountered to a maximum depth of 60 cm depth below surface (DBS). All excavated back-dirt was broken up using a shovel and trowel, when required, to closely inspect for artifacts. All back-dirt was then trowelled through for artifacts while backfilling the excavated shovel probe. No buried artifacts, features or paleosols were discovered during the HRIA.

The results of the HRIA are summarized per quarter-section in the Table below (Table 3) (Figures 2A and 2B). Table 3 includes a brief summary of the HRIA results / quarter-section and includes fieldwork observations, fieldwork results and references to Photos and Figures.

Table 3: Summary of the Outlaw Trail HRIA Fieldwork Results (Permit No. 20-114)

Quarter-section	*Fieldwork Observations*	*Fieldwork Results*	*Photo / Figure Reference*
NE 9-3-25 W2M	Areas of native prairie along shallow coulees. General Stratigraphy: 0 cm to 1 cm sod 1 cm to 3 cm brown loam/clay; 3 cm to 20 cm grey/tan clay with gravel.	270 m of collector line ROW assessed 5 shovel probes excavated. Access Road follows existing bladed trail with shallow ditches (disturbed area).	Photo 1 Figures 2A, 3A and 3B
NW 10-3-25 W2M	Area of native prairie limited to hill tops/irregular ridge features. General Stratigraphy: 0 cm to 1 cm sod 1 cm to 5 cm gravel.	400 m of collector line ROW and small portion of access road ROW assessed. 9 shovel probes excavated.	Photo 2 Figures 2A and 3B
NE 1-3-25 W2M	Area of native prairie along shallow draw. Majority of native prairie is located on sloped (west slope) terrain. General Stratigraphy: 0 cm to 1.5 cm sod 1.5 cm to 3 cm brown loam/clay; 3 cm to 10 cm gravel and cobbles.	385 m of collector line ROW assessed 6 shovel probes excavated.	Photo 3 Figures 2A, 2B and 3C

SE 8-3-24 W2M	Rolling native prairie. General Stratigraphy: 0 cm to 1.5 cm sod 1.5 cm to 3 cm dark brown clay; 3 cm to 20 cm grey clay and gravel.	485 m of collector line ROW assessed 6 shovel probes excavated.	Photo 4 Figures 2A, 2B and 3D
SW and SE 4-3-24 W2M	Rolling native prairie. General Stratigraphy: 0 cm to 0.5 cm sod; 0.5 cm to 2 cm dark brown sand/loam; 2 cm to 10 cm dark brown sand/clay and gravel; 10 cm to 22 cm brown clay; 22 cm to 30 cm grey clay.	1,200 m of collector line ROW assessed 10 shovel probes excavated.	Photo 5 Figures 2A, 2B and 3E
SW 3-3-24 W2M	Area of native prairie intersected by 2 north/south trending coulees. Rolling terrain. General Stratigraphy: 0 cm to 1 sod; 1 cm to 4 cm dark brown loam/clay; 4 cm to 18 cm brown clay and gravel; 18 cm to 25 cm grey clay and gravel.	540 m of collector line ROW assessed. 8 shovel probes excavated	Photo 6 Figures 2B and 3F
SW 2-3-24 W2M	Area of native prairie located east of Highway No. 34 to west edge of coulee. Cultivated/modified pasture in coulee bottom and east side of coulee. General Stratigraphy: 0 cm to 1.5 cm sod; 1.5 cm to 3 cm dark brown loam/clay; 3 cm to 10 cm gravel and cobbles.	530 m of collector line ROW assessed. 3 shovel probes excavated	Photo 7 Figures 2B and 3G

No archaeological sites (artifacts, surface features) were discovered in conflict with the Outlaw Trail Wind Project. Based on the results of the HRIA, there are no recommendations for further archaeological work with the current footprint of the Outlaw Trail Wind LP's Outlaw Trail Wind Power Project.

Photo 1: View southeast from shovel probe B01 in NE 9-3-25 W2M.

Photo 2: View northeast from shovel probe A07 in NW 10-3-25 W2M.


Photo 3: View northwest from shovel probe A10 in NE 1-3-25 W2M.

Photo 4: View southwest in SE 8-3-34 W2M. Archaeologist excavating shovel probe B06.


Photo 5: View southeast in SW 4-3-24 W2M. Archaeologist near shovel probe B07.

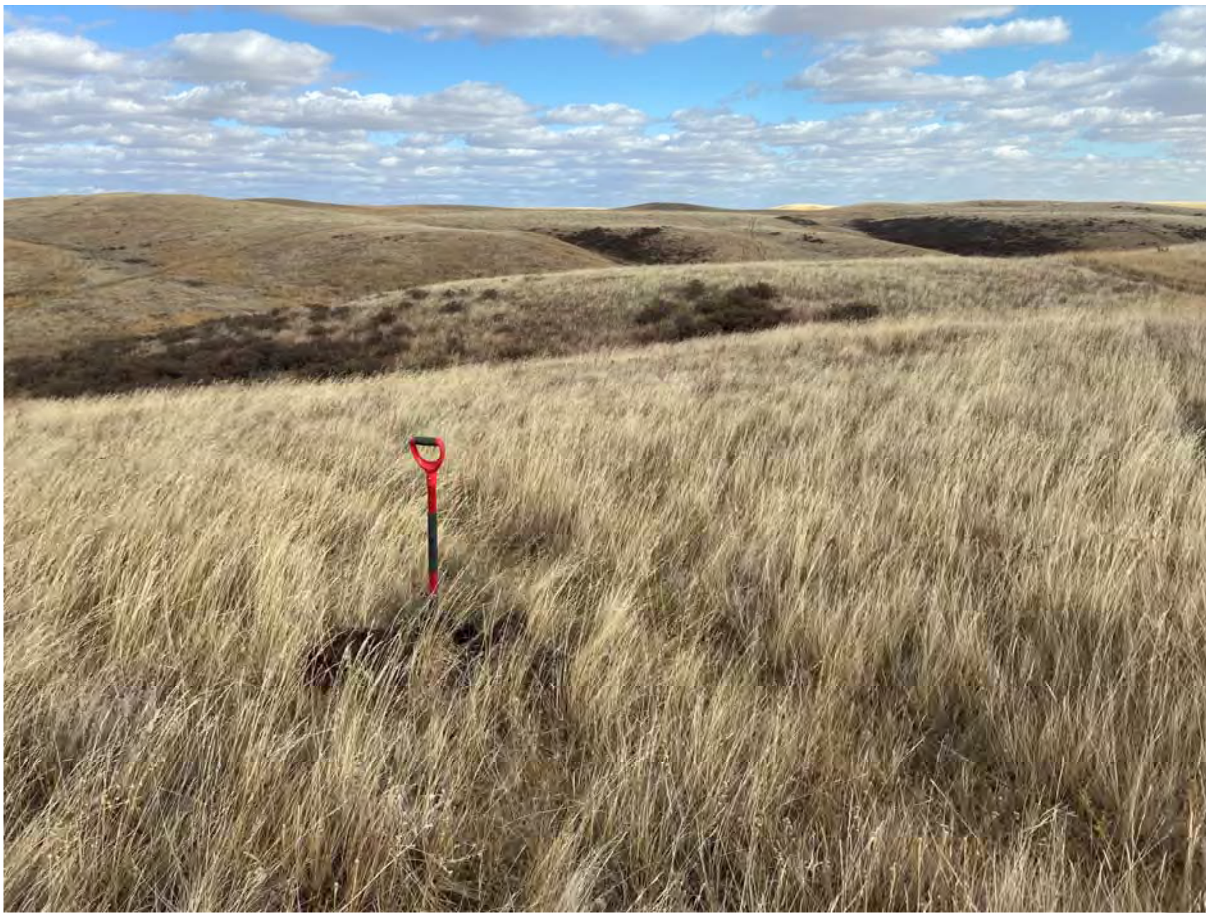
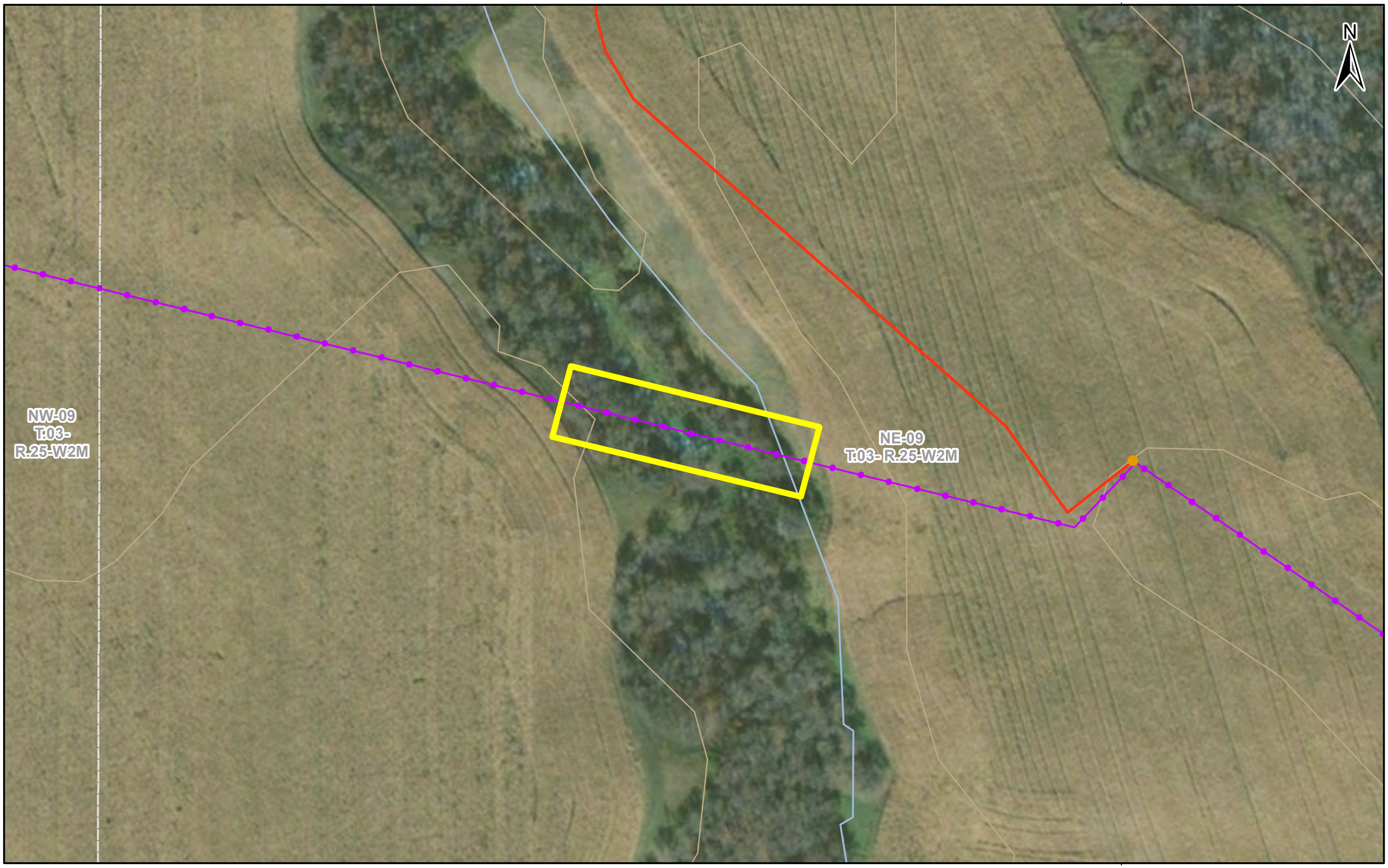
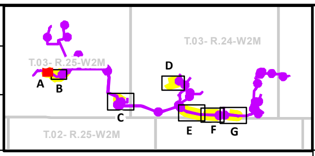


Photo 6: View east from shovel probe A15 in SW 3-3-24 W2M.

Photo 7: View east from shovel probe A23 in SW 2-3-24 W2M. Note: cultivated field in coulee bottom and on east side of coulee.



NOVEMBER 2020		Shovel Probe (Negative) / Archaeological Site Recorded during HRIA (Permit No. 20-018) / Known Heritage Resource / Known Heritage Resource Area / Area Assessed	DETAILED MAP
AH20014		Junction Box / Met Tower / OLT WTG Location / Underground Collector / Road / 1:50,000 Contour Line	HRIA FOR OUTLAW TRAIL WIND PROJECT (PERMIT NO. 20-114)
SCALE: 1:2,000			



0 50 100
Meters
(ALL LOCATIONS APPROXIMATE)

Projection: NAD 1983 UTM Zone 13N . NTS Map Sheet 72 H/03.
Data Sources: CANVEC, 2020. Information Services Corporation, 2020. Image Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Image Date: October 13, 2016.

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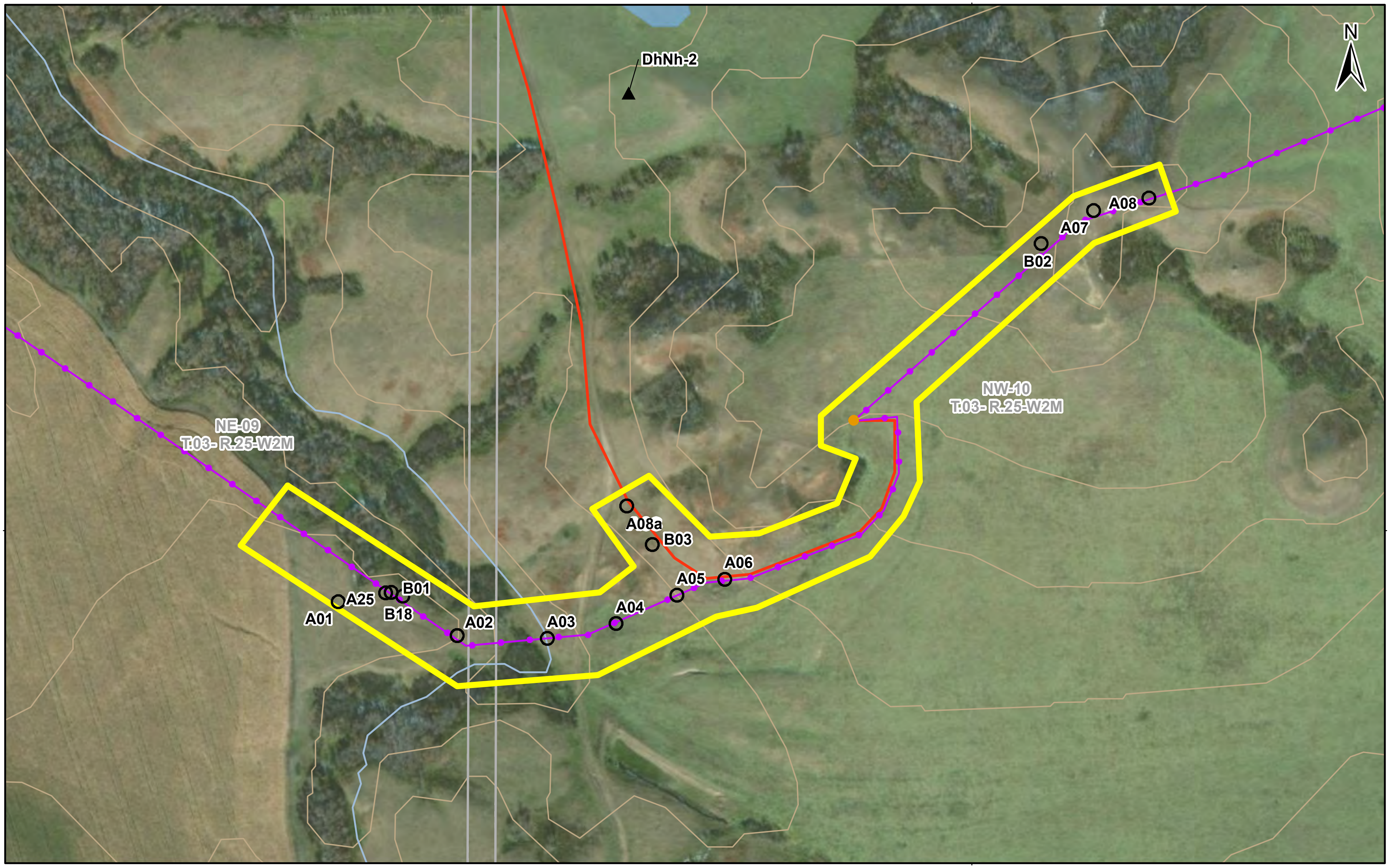
FIGURE 3A

478400

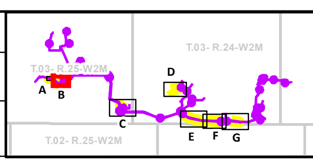


5449600

5449600

478400

NOVEMBER 2020		
AH20014		
SCALE: 1:4,000		



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Meters
(ALL LOCATIONS APPROXIMATE)

- Shovel Probe (Negative)
- Archaeological Site Recorded during HRIA (Permit No. 20-018)
- Known Heritage Resource
- Known Heritage Resource Area
- Area Assessed
- Junction Box
- Met Tower
- OLT WTG Location
- Underground Collector
- Road
- 1:50,000 Contour Line

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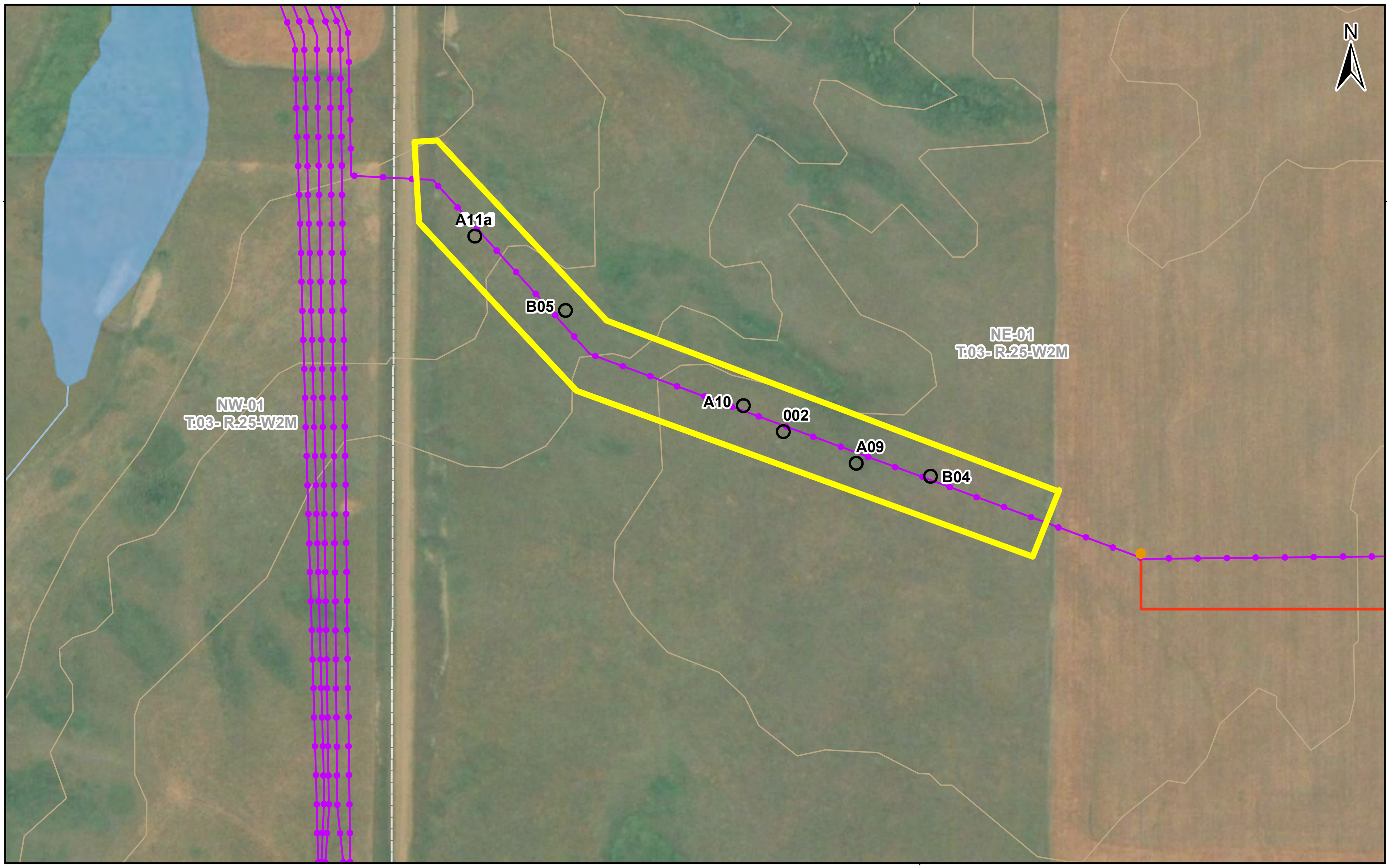
Projection: NAD 1983 UTM Zone 13N . NTS Map Sheet 72 H/03.
Data Sources: CANVEC, 2020. Information Services Corporation, 2020. Image Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Image Date: October 13, 2016.

DETAILED MAP

HRIA FOR
OUTLAW TRAIL WIND PROJECT
(PERMIT NO. 20-114)

FIGURE 3B



NOVEMBER 2020

AH20014

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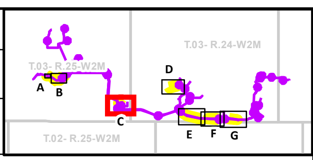

0 50 100

Meters

(ALL LOCATIONS APPROXIMATE)

Shovel Probe (Negative)

Archaeological Site Recorded during HRIA (Permit No. 20-018)

Known Heritage Resource

Known Heritage Resource Area

Area Assessed

Junction Box

Met Tower

OLT WTG Location

Underground Collector

Road

1:50,000 Contour Line

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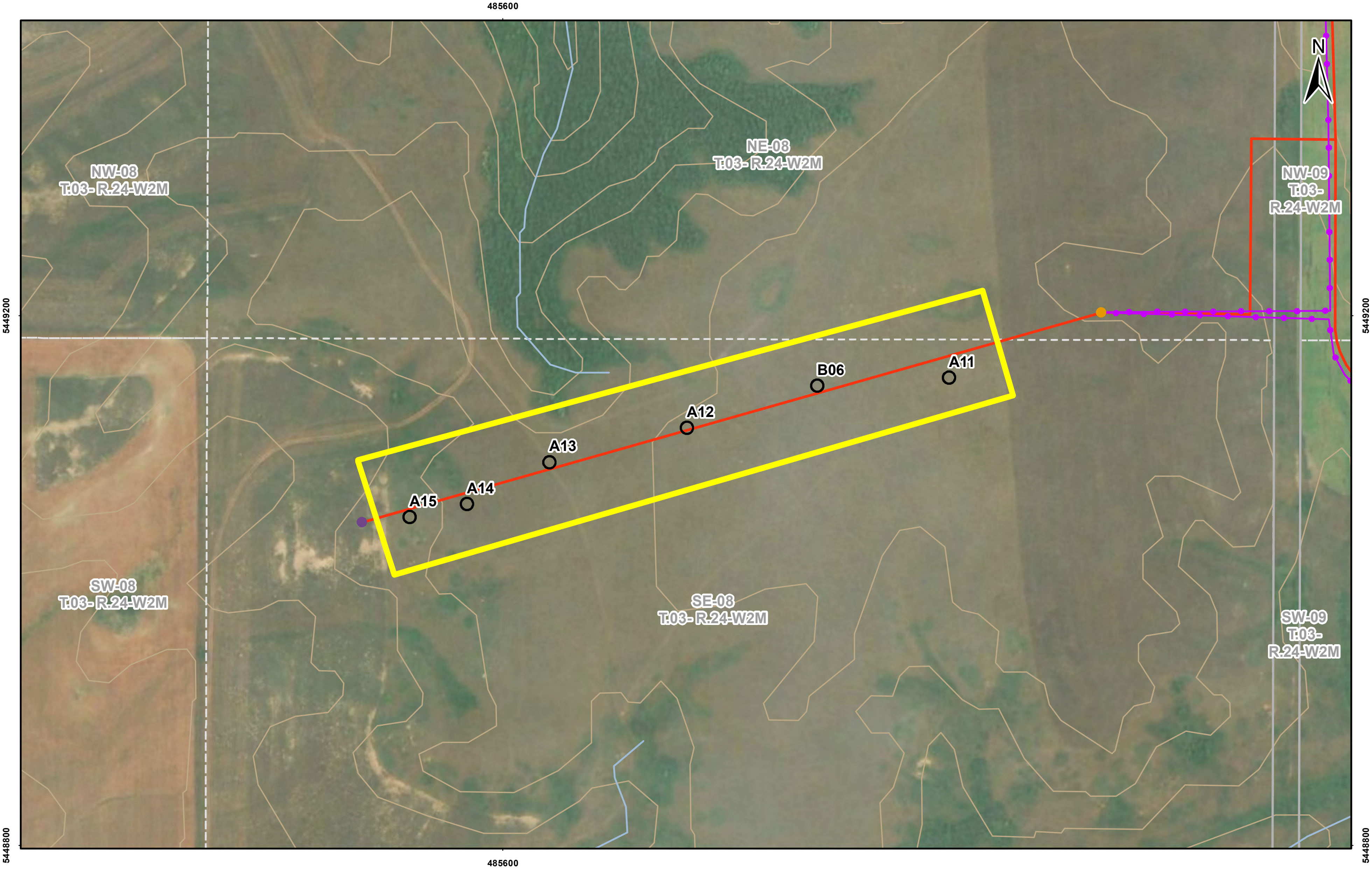
Projection: NAD 1983 UTM Zone 13N . NTS Map Sheet 72 H/03.
Data Sources: CANVEC, 2020. Information Services Corporation, 2020. Image Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Image Date: October 13, 2016.

DETAILED MAP

HRIA FOR
OUTLAW TRAIL WIND PROJECT
(PERMIT NO. 20-114)

FIGURE 3C



NOVEMBER 2020
AH20014
SCALE: 1:4,000

Shovel Probe (Negative)
Archaeological Site Recorded during HRIA (Permit No. 20-018)
Known Heritage Resource
Known Heritage Resource Area
Area Assessed
Junction Box
Met Tower
OLT WTG Location
Underground Collector
Road
1:50,000 Contour Line

0 50 100
Meters
(ALL LOCATIONS APPROXIMATE)

Projection: NAD 1983 UTM Zone 13N . NTS Map Sheet 72 H/03.
Data Sources: CANVEC, 2020. Information Services Corporation, 2020. Image Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Image Date: October 13, 2016.

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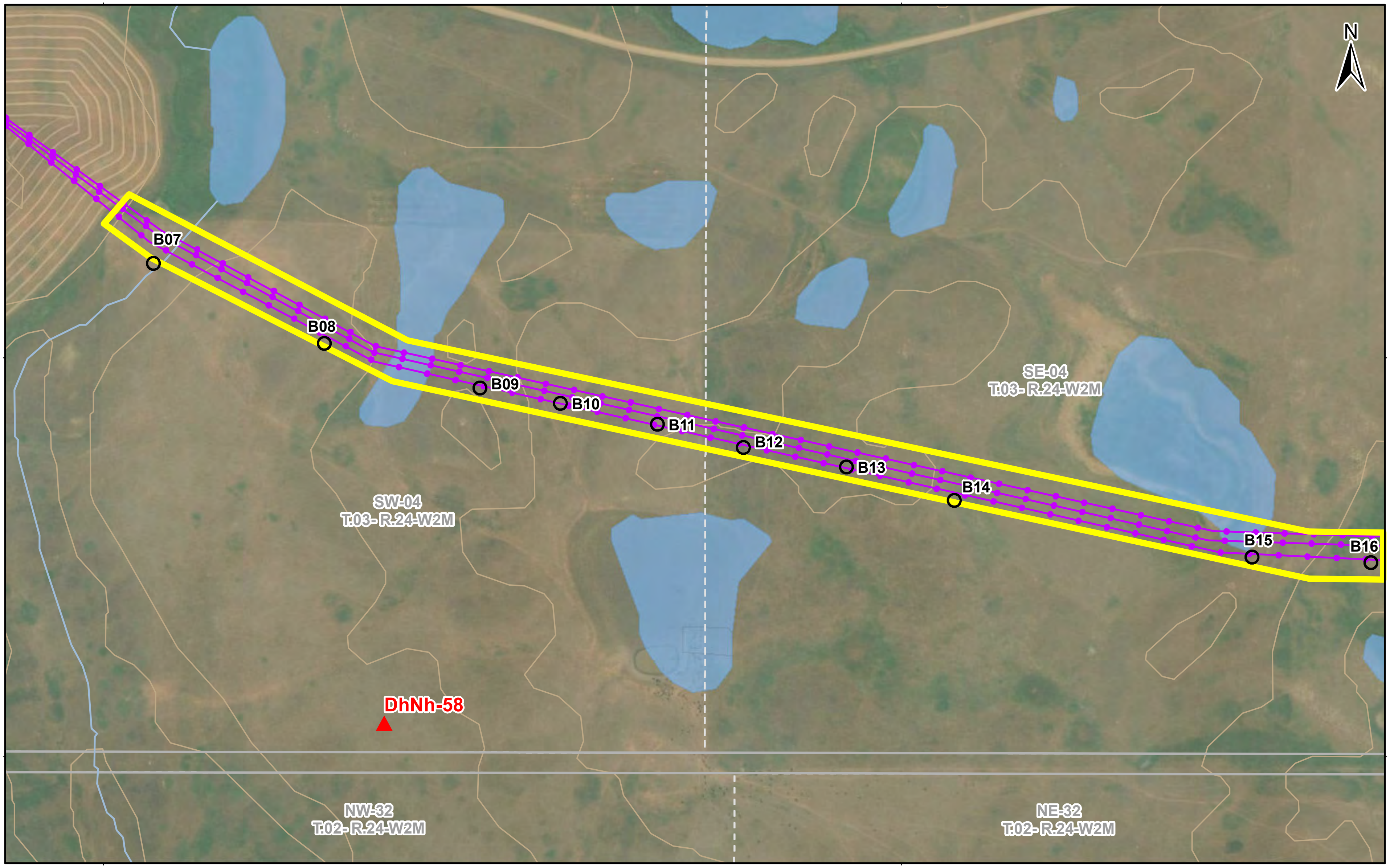
DETAILED MAP

HRIA FOR
OUTLAW TRAIL WIND PROJECT
(PERMIT NO. 20-114)

FIGURE 3D



NOVEMBER 2020	
AH20014	
SCALE: 1:5,500	

0 50 100
Meters
(ALL LOCATIONS APPROXIMATE)

- Shovel Probe (Negative)
- Archaeological Site Recorded during HRIA (Permit No. 20-018)
- Known Heritage Resource
- Known Heritage Resource Area
- Area Assessed
- Junction Box
- Met Tower
- OLT WTG Location
- Underground Collector
- Road
- 1:50,000 Contour Line

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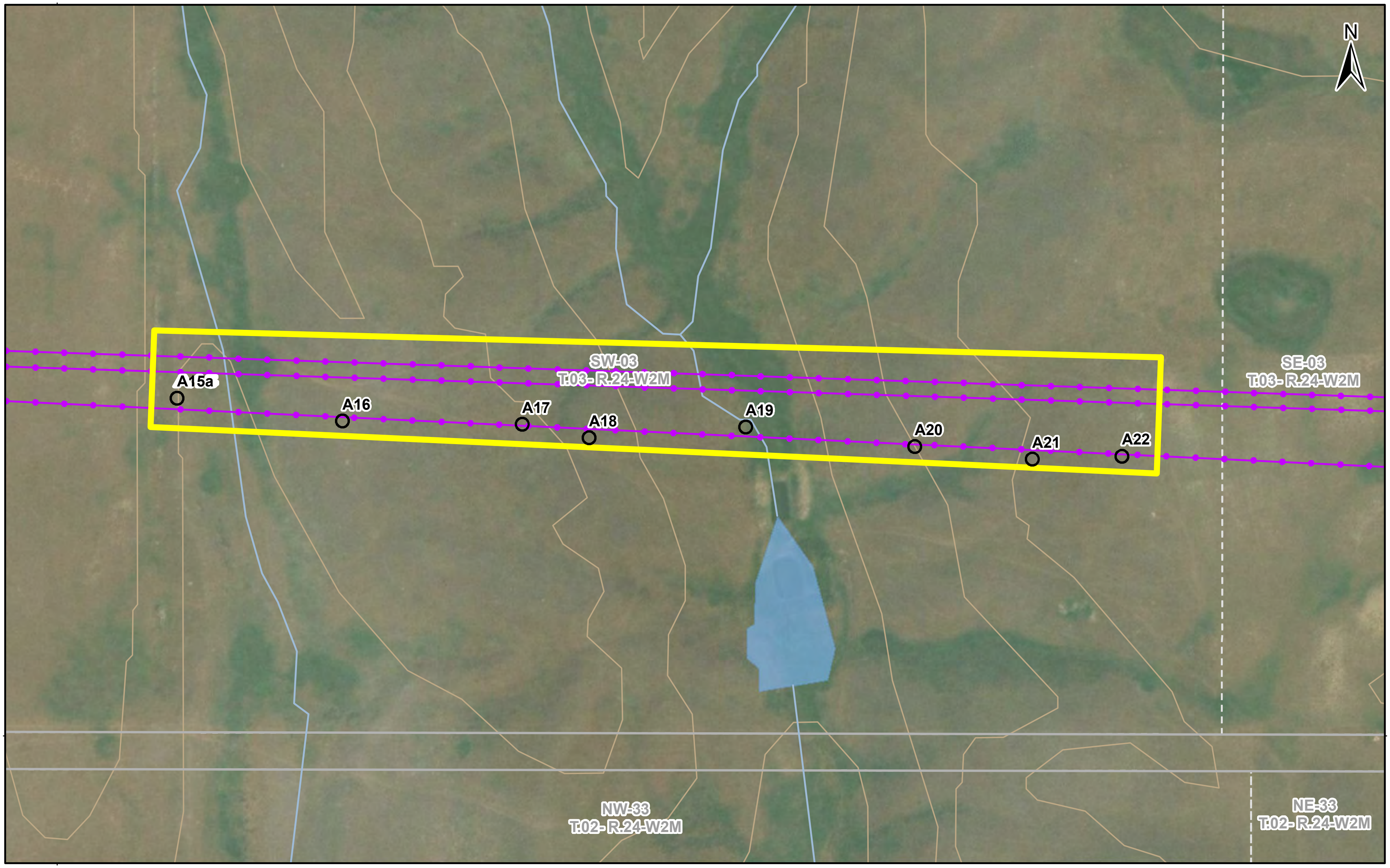
Projection: NAD 1983 UTM Zone 13N . NTS Map Sheet 72 H/03.
Data Sources: CANVEC, 2020. Information Services Corporation, 2020. Image Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Image Date: October 13, 2016.

DETAILED MAP

HRIA FOR
OUTLAW TRAIL WIND PROJECT
(PERMIT NO. 20-114)

FIGURE 3E



NOVEMBER 2020	
AH20014	
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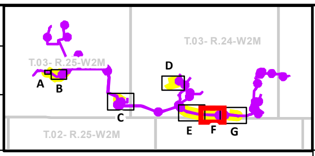

0 50 100
Meters
(ALL LOCATIONS APPROXIMATE)

- Shovel Probe (Negative)
- Archaeological Site Recorded during HRIA (Permit No. 20-018)
- Known Heritage Resource
- Known Heritage Resource Area
- Area Assessed
- Junction Box
- Met Tower
- OLT WTG Location
- Underground Collector
- Road
- 1:50,000 Contour Line

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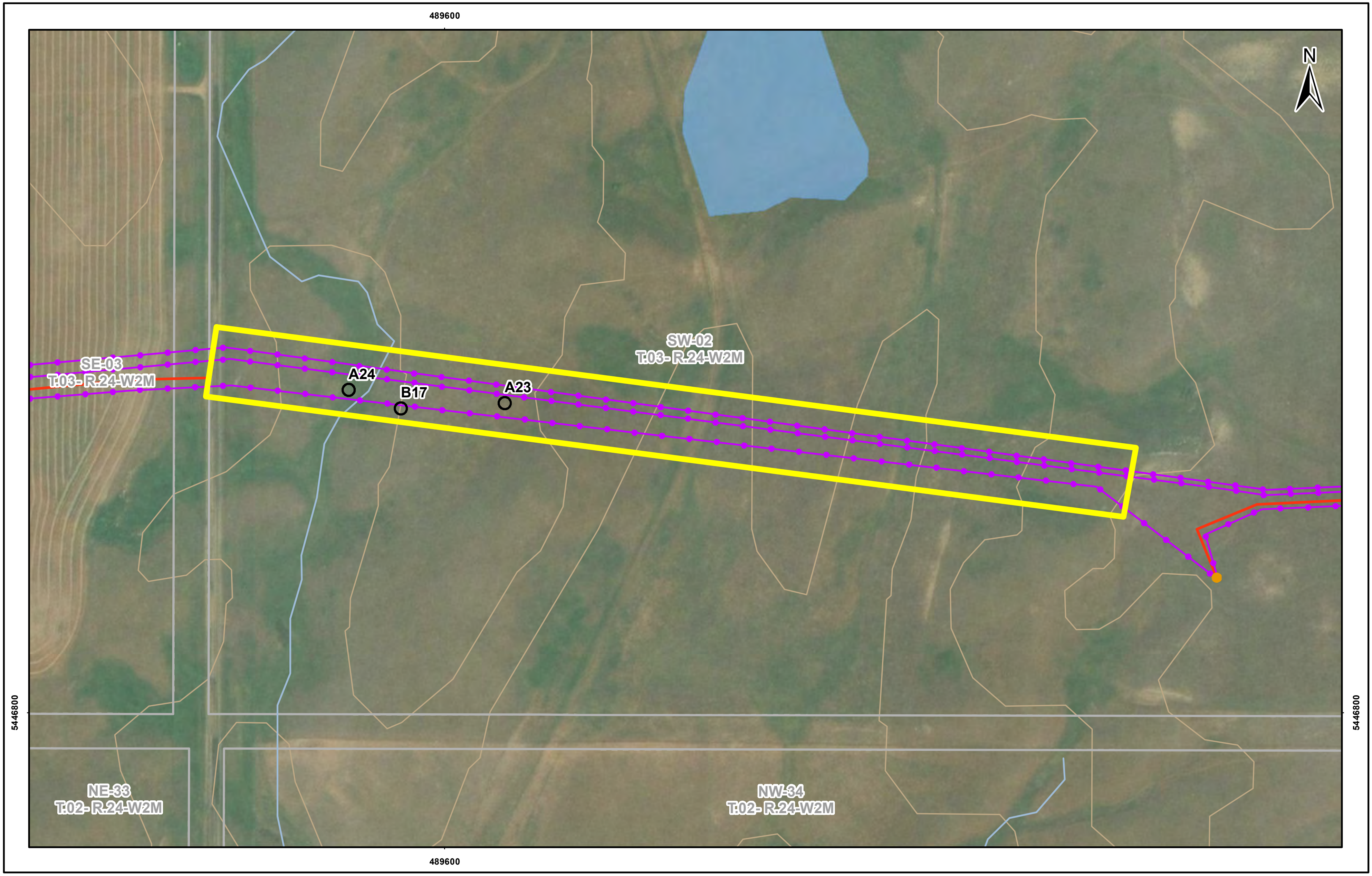
Projection: NAD 1983 UTM Zone 13N . NTS Map Sheet 72 H/03.
Data Sources: CANVEC, 2020. Information Services Corporation, 2020. Image Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Image Date: October 13, 2016.

DETAILED MAP

HRIA FOR
OUTLAW TRAIL WIND PROJECT
(PERMIT NO. 20-114)

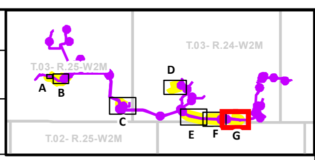
FIGURE 3F



NOVEMBER 2020

AH20014

SCALE: 1:3,000



0 50 100
Meters
(ALL LOCATIONS APPROXIMATE)

Shovel Probe (Negative)
Archaeological Site Recorded during HRIA (Permit No. 20-018)
Known Heritage Resource
Known Heritage Resource Area
Area Assessed
Junction Box
Met Tower
OLT WTG Location
Underground Collector
Road
1:50,000 Contour Line

atlheritage

Projection: NAD 1983 UTM Zone 13N . NTS Map Sheet 72 H/03.
Data Sources: CANVEC, 2020. Information Services Corporation, 2020. Image Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Image Date: October 13, 2016.

DETAILED MAP

HRIA FOR
OUTLAW TRAIL WIND PROJECT
(PERMIT NO. 20-114)

FIGURE 3G

6.0 SUMMARY AND RECOMMENDATIONS

A HRIA was completed for Outlaw Trail Wind LP's proposed Outlaw Trail Wind Project under Archaeological Resource Investigation Permit No. 20-114 (HCB File No. 20-247) (Figures 1; 2A to 2B; Figures 3A to 3G). The HRIA was completed on September 30, 2020.

The HRIA was completed using a combination of pedestrian reconnaissance, inspection of surface and subsurface exposures and the excavation of 47 shovel probes (Figures 3A to 3G; Appendix A). In total, 3.8 km of ROW was assessed (Figures 2A and 2B; Figures 3A to 3G). No archaeological sites are in conflict with the current footprint of the Outlaw Trail Wind Project (Figures 2A and 2B).

In addition, the revised footprint of the Outlaw Trail Wind Project will no longer impact DhNh-57, DhNh-58 and DhNh-56 (Figures 1; 2A and 2B). Archaeological site DhNh-56 was discovered during a HRIA in 2017 and was determined to have low interpretive and scientific value (Atlheritage 2020). Therefore, there are no further heritage concerns (i.e. mitigation requirements) with the current footprint of the Outlaw Trail Wind Project.

It is recommended that Outlaw Trail Wind LP be provided with regulatory approval as per Section 63 of *The Heritage Property Act* for concluding the heritage requirements for their proposed Outlaw Trail Wind Project. This report fulfills the permitting requirements for the HRIA (Permit No. 20-114). If heritage resources are discovered during construction activities, or if the Project footprint changes, immediately notify Atlheritage (306.242.2822) and/or the HCB (306.787.2817). If human remains are discovered, please contact the local RCMP detachment and the HCB.

7.0 CLOSURE

The results of the pre-impact HRIA are discussed in this report. Following the HCB's approval and receipt of the Permit Report, the HCB will issue a Heritage Clearance Letter for this Project. On behalf of Atlheritage, thank-you for adhering to *The Heritage Property Act* and your role in protecting and preserving Saskatchewan's heritage.

If you have any questions regarding this HRIA, please contact Atlheritage.

Respectfully submitted,

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Co-founder, Principal Archaeologist
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APPENDIX A: Shovel Probes

Appendix A

Shovel Probe UTM Locations			
Shovel Probe	**Zone (NAD 83)**	**Easting**	**Northing**
Outlaw Trail Wind Project			
002	13U	482326	5447874
A01	13U	477938	5449548
A02	13U	478025	5449523
A03	13U	478091	5449522
A04	13U	478141	5449532
A05	13U	478185	5449553
A06	13U	478220	5449565
A07	13U	478489	5449833
A08	13U	478529	5449843
A08a	13U	478149	5449618
A09	13U	482365	5447857
A10	13U	482304	5447888
A11	13U	482157	5447981
A11a	13U	485937	5449153
A12	13U	485739	5449115
A13	13U	485635	5449089
A14	13U	485573	5449058
A15	13U	488066	5446985
A15a	13U	485530	5449048
A16	13U	488156	5446972
A17	13U	488254	5446971
A18	13U	488291	5446963
A19	13U	488377	5446969
A20	13U	488469	5446958
A21	13U	488533	5446951
A22	13U	488582	5446953
A23	13U	489635	5446978
A24	13U	489545	5446985
A25	13U	477973	5449555
B01	13U	477977	5449555
B02	13U	478451	5449809
B03	13U	478167	5449590
B04	13U	482406	5447850
B05	13U	482206	5447941
B06	13U	485838	5449147
B07	13U	486450	5447244
B08	13U	486621	5447215
B09	13U	486777	5447170
B10	13U	486858	5447154
B11	13U	486955	5447133
B12	13U	487042	5447110
B13	13U	487145	5447090
B14	13U	487253	5447057

Appendix A

Shovel Probe UTM Locations			
Shovel Probe	Zone (NAD 83)	Easting	Northing
B15	13U	487551	5447000
B16	13U	487671	5446995
B17	13U	489575	5446975
B18	13U	477985	5449552

J.3 Heritage Conservation Branch Clearance Letter

Ministry of Parks, Culture and Sport
Heritage Conservation Branch
2nd Floor, 3211 Albert Street
Regina, Canada S4S 5W6

Phone: 306.787.5774
Fax: 306.787.0069

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November 30, 2020 Our file: 20-247

Mike Markowski
Atlheritage Services Ltd.
Agent For: **Outlaw Trail Wind Limited Partnership (c/o BluEarth Renewables Inc.)**
150 – 203 Packham Avenue
SASKATOON SK S7N 4K5
Email: mike.markowski@atlheritage.ca

Dear Mike Markowski:

RE: Outlaw Trail Wind Limited Partnership – Proposed Outlaw Trail Wind Energy Project Revisions:
Townships 2 and 3, Ranges 23, 24 and 25, W2M;
Heritage Resource Impact Assessment Results (Permit #20-114)

Please be advised we received (November 26, 2020) a final report from Atlheritage Services Ltd., on the heritage resource impact assessment (HRIA) of this project completed under Investigation Permit #20-114. An HRIA for the original footprint of the Outlaw Trail Wind Energy Project was conducted under Permit #20-018. Revisions to the placement of the collector lines resulted in additional HRIA requirements, conducted under Permit #20-114. This letter replaces the previous heritage clearance letter for this project issued on July 3, 2020 (based on the results of Permit #20-018).

No new or previously recorded heritage sites were observed in the course of the heritage assessment, despite the moderate to high potential of the area. In addition, the revised footprint of the Outlaw Trail Wind Project will no longer impact DhNh-56 (artifact find site), DhNh-57 (multiple feature site), and DhNh-58 (recurrent feature site) and the previous requirements to avoid these sites is no longer applicable. As all HRIA regulatory requirements have now been satisfactorily completed, this office has no concerns with this development proceeding as planned.

On behalf of the Heritage Conservation Branch, thank you for your continuing assistance and support in preserving Saskatchewan's archaeological heritage.

Sincerely,

Thomas Richards

Dr. Thomas Richards
Senior Archaeologist

Appendix K

Employment and Economy

Outlaw Trail Wind LP
Outlaw Trail Wind Energy Project
February 2021 - 19-1825

K.1 Value-Added Community Benefits Plan

Outlaw Trail Wind LP

Outlaw Trail Wind Energy Project
Value-Added Community Benefits Plan

November 2020

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1.0 Introduction

Outlaw Trail Wind LP (OTW LP), a partnership between BluEarth Renewables Inc. (BluEarth) and NuWind Energy Corp., has been developing the Outlaw Trail Wind Energy Project (the Project) for more than five years. The Project is located approximately 20 kilometres east of the Village of Coronach, in south-central Saskatchewan. To support a proposal submission to Saskatchewan Power Corporation (SaskPower) in response to its Request for Proposals issued for the development and operation of a Wind Energy Facility (Inquiry Number: RVS/155(2)), OTW LP has prepared this Value-Added Community Benefits Plan for the Project to fulfill the Section 10.7 and Form 10 requirements.

BluEarth is a Canadian company that values supporting local communities corporately and where its projects are located. BluEarth is continually evaluating the needs of the community to determine how best to service those needs. Partnerships with local organizations, use of local labour and suppliers, and community investments through initiatives like scholarships are some of the opportunities that BluEarth actively seeks to support the communities where projects are located. BluEarth also recognizes that community benefits extend beyond the human environment and seeks to enhance the sustainability of the natural landscape and its ecological value to the community.

NuWind Energy Corp. is a wholly-owned subsidiary of FHQ Developments, the investment and economic development corporation for the File Hill's Qu'Appelle Tribal Council and is owned by 11 Nations. FHQ Development's mission is to enable long-term economic independence and prosperity of its citizens.

For additional information on the consultation and engagement initiatives that have been ongoing for the past five years and planned for the future with Project Area residents, Indigenous communities, and local municipalities, please see the Community Engagement Plan provided to fulfill the requirements of Form 9 of the RFP.

1.1 Local Context

The Project is located in the Rural Municipalities of Hart Butte (RM No. 11) and Happy Valley (RM No. 10), 20 km east of the Town of Coronach, and is located on Treaty 4 First Nations territory. The primary economic drivers of this community and surrounding areas are the Westmoreland Mining Holdings LLC's Poplar River Coal Mine, SaskPower's Poplar River Power Station, and commercial agriculture. With the mine and power station scheduled to close by 2030, the Town of Coronach and neighbouring communities are predicted to lose approximately 300 jobs.

1.2 Regional Context

The Town of Coronach and area communities have been evaluating future economic opportunities and initiatives to remain viable. To evaluate potential economic transition options, the Town of Coronach engaged MDB Insight to produce an Economic Transition Plan and Socio-economic Impact Study for the Town in anticipation of the closure of the mine and power station. As a result of these initiatives, the South Saskatchewan Regional Economic Partnership (SSREP; formerly the Deep South Economic Partnership) was formed by a group of nine communities including the Town of Coronach, the Rural Municipality of Happy Valley and the Rural Municipality of Hart Butte. The SSREP has created a 2020-2022 Workplan outlining strategic objectives and short-term action items. The five main strategic pillars consist of 1) Workforce transition, retention and attraction; 2) Resource development; 3) Tourism development; 4) Business retention, expansion and attraction; and 5) Organizational capacity.

2.0 Indigenous Benefits

BluEarth recognizes that the Project is located within Treaty 4 lands and acknowledges the diverse Indigenous communities that inhabit these lands. BluEarth has partnered with NuWind Energy Corp. to develop, own and operate the Project. NuWind Energy Corp. is a wholly-owned subsidiary of FHQ Developments (FHQ). FHQ is the investment and economic development corporation for the File Hill's Qu'Appelle Tribal Council and is owned by 11 Nations including Nekaneet, Piapot, Muscowpetung, Pasqua, Wood Mountain, Standing Buffalo, Carry the Kettle, Star Blanket, Peepeekisis Little Black Bear and Okanese. The Nations ownership represents over 16,000 citizens throughout southern Saskatchewan within the Treaty 4 territory.

FHQ Developments' vision is focused on growing the financial independence of their Nations in a way that is sustainable and focused on the long term. Building wealth and financial independence does not just include looking at the bottom line of investments and businesses but focusing on other areas that help to build wealth in their communities such as building of capacity and reinvesting profits back into new businesses. It is through these principles of growing the Nations that FHQ Developments is able to ensure the wealth they are generating continues to revolve multiple times before it leaves local economies in which FHQ does business.

Through its partnership in the Outlaw Trail Wind Energy Project, FHQ / NuWind / the eleven Nations and their members will benefit through the following:

1. **Ownership: 49% equity ownership in the Project.**
    - This ownership structure will see wealth created and redistributed over the life of the Project
    - This will give greater opportunity to procure contracts of which FHQ Developments companies have the capacity to deliver, allowing for additional wealth to be generated through those companies that will benefit the 11 Nations
    - FHQ Tribal Council Nations will take pride in being the first Indigenous equity owner in a major renewable energy project in Saskatchewan

2. **Capacity Development & Labour: Creating Indigenous capacity in renewables.**
    - Tokata HR Solutions will provide access to a large database of Indigenous professionals from throughout Saskatchewan to ensure there is greater impact on Indigenous labour and capacity development
    - FHQ Developments companies will support the Project through contracts that will increase its capacity for future renewable energy projects in Saskatchewan
    - FHQ Developments companies will also seek opportunities to leverage small and medium sized Indigenous enterprises to subcontract in situations where it is possible to do so, including businesses owned by Wood Mountain Lakota Nation

3. **Reinvestment: Ensuring the wealth that is generated in Saskatchewan stays in Saskatchewan.**
    - FHQ Developments believes in reinvestment, including in new businesses or back into the communities it serves
    - FHQ Developments major focus for community reinvestment is on youth engagement to ensure Indigenous youth are given opportunity to develop and become a part of the future workforce in Saskatchewan. This investment focuses on youth programming in entrepreneurship, STEM, Arts, Culture, Sports, and Language.
    - FHQ Developments has created an economic impact tool that will demonstrate the overall economic impact in the Saskatchewan economy through their participation and ownership in the Project

3.0 Community Benefits

OTW LP recognizes the value of the proposed Outlaw Trail Wind Energy Project to the economic transition of the coal-affected Town of Coronach and surroundings communities. OTW LP attended one of the consultation sessions held in Coronach in November 2019 to determine how the Project could contribute to the transition and support other community initiatives. As such, OTW LP is confident that the initiatives detailed in this plan will result in true and meaningful benefits to the local and regional community.

The Project will contribute to achieving the Town of Coronach and the SSREP's strategic objectives outlined in its 2020-2022 Workplan. Initial discussions have been held with the Community Development Officer for the Town of Coronach and the Managing Director of the SSREP. Once the Project is awarded a Power Purchase Agreement, the initiatives outlined below will be implemented:

1) **Workforce Transition, Retention and Attraction:** *SSREP is developing a workforce transition/ development plan with SaskPower and Westmoreland Coal Company.*
    - Workforce transition – the Project will require approximately 120 full-time workers during the 18-month construction period and during operations, six full-time technicians

and one site supervisor with similar skills applicable to thermal energy generation such as electricians and millwrights. Further details are provided in Section 4.1 and 4.2.

- Skills training – the BluEarth Renewables Scholarship Program offers scholarship opportunities, mentorship and work experience with wind technicians. BluEarth also offer talks in schools from our operators and head office staff to learn about renewable energy and paths to a career in this field. A Project-specific scholarship will be created for Coronach School graduating students interested in pursuing a career in renewable energy, or local tradespeople looking to make the switch from coal to renewable energy Further detail is provided in Section 7.0.

2) **Resource Development**: *SSREP plans to work with SaskPower to identify all respondents to the Solar and Wind power generation RFQ and RFP process to develop a shortlist of proponents who may be interested in developing facilities in the region.*
    - OTW LP has met with the Managing Director of the SSREP, the local RMs and the Economic Transition Coordinator for the Town of Coronach to discuss the direct and indirect benefits of this Project to the community.
    - Coronach is interested in bringing more solar power to the community and OTW LP will support efforts with knowledge sharing and in-kind contributions to develop a community based renewable energy project, such as a micro-solar facility or roof-top solar installations. The local group, EDY Cooperative, is looking into installing roof-top solar panels on a historic building in town and rooftop solar has also been proposed for the large Sportsplex in Coronach.

3) **Tourism Development:** *SSREP will investigate opportunities associated with the completion of Regional Festivals and Event Strategy to attract and host destination events*.
    - OTW LP has met with a local tourism operator (Big Muddy Tours) to discuss including the Project, should it be successful, in its tour offerings.
    - The significant western heritage of the Project area as a tourist attraction is under used. The Big Muddy Valley just northeast of the Project was known as Station No. 1 on an Outlaw Trail that ran all the way to Mexico. Having a wind project named after this famous trail will generate interest in this local history. OTW LP will sponsor a roadside turnout information sign to educate tourists about the historic significance of the area and its role in the famous Outlaw Trail.
    - OTW LP will erect information boards adjacent to the Project to educate tourists and the general public about wind energy and its benefits.
    - In its partner communities, BluEarth sponsors local events such as the Hand Hills Rodeo, the Beaverton Agricultural Fair, local holiday parades, and more. OTW LP would support

local festivals and participate in local fair events to educate the local population and tourists about renewable energy.

4) **Business Retention, Expansion and Attraction:** *SSREP wants to secure broadband internet infrastructure upgrade to increase the region's accessibility for resident and business attraction*.
    - OTW LP is proposing to support expansion of telecommunications in the area by working with a local telecommunications company to share infrastructure being built for the Project. Further details are provided in Section 6.0.
    - The Project will create indirect benefits through the use of local businesses such as supplies, services, restaurants and motels. Refer to Section 4.3 for details.

5) **Organizational Capacity:** *SSREP is working to improve local (water, sewer) and regional (digital) infrastructure including public wifi.*
    - OTW LP will work with local service providers to explore shared use of infrastructure being built for the Project, such as new electrical and communications systems. Further details are provided in Section 6.0.

4.0 Local Employment Opportunities

4.1 Construction

OTW LP will work with its general contractor to maximize the use of local contractors on the Project. Prior to construction, OTW LP will have a contractor and employment open house in the community for the general contractor to meet suitable local companies and workers for sub-contracting and employment opportunities that are available to the Project. OTW LP anticipates that the Project will result in approximately 175,000 person hours during the 18-month construction period. Jobs will range from labourers, to skilled tradespeople to engineering, management, environment and health and safety.

4.2 Operations

OTW LP's preference is to hire locally for the operations staff if a suitable candidate(s) is available. Operations staff are expected to reside within the local Project area, within an hour drive. During operation, OTW LP estimates that the Project will provide approximately seven full-time employees in technician and supervisory positions. Local skilled tradespeople from other industries, such as thermal power generation, may be ideal candidates to fill these positions. OTW LP will be looking specifically for millwrights and electricians, and experience working with high voltage is also important.

4.3 Indirect Employment and Community Support

The Project will represent a major generation site that will require scheduled and unscheduled maintenance on a regular basis. Local service providers will be given the opportunity to supply goods and services for this work. Likewise, from time to time specialised workers will be required as part of maintenance activities. These workers will require hotel rooms, food and entertainment, bringing revenue into the local hospitality sector. Specifically, OTW LP will engage local residents and companies to provide snow clearing, vegetation management, site security, and housekeeping services.

5.0 Municipal Revenue Benefits

Through the development of the Project, the two Rural Municipalities that overlap the Project will gain significant economic benefits through business taxes. It is estimated that the Project would result in an increase of 26% in municipal taxes for the Rural Municipality of Hart Butte and an increase of 268% for the Rural Municipality of Happy Valley, based on 2019 values. The Project will contribute over $1.4 Million annually in municipal and education property taxes. This source of new, sustained revenue for the municipalities over the next twenty-five years will dramatically increase the Municipalities available budgets.

6.0 Community Improvements

BluEarth contributes to local community initiatives and invests into the local communities where its employees live, work and operate. Its community investment program is targeted to provide financial support for local initiatives that align with its giving priorities of:

- Environment
- Community Building
- Education

These community improvement initiatives align well with the strategic objectives and associated action items identified by the Town of Coronach and in the SSREP workplan. Specifically, the need for more secure and reliable telecommunications connections was identified in two SSREP strategic objectives. As the Project will require the installation of communication and meteorological towers as a component of the remote monitoring infrastructure, sharing of this infrastructure with a local telecommunications provider is possible. This would result in improved telecommunications to local residents and communities, and support the SSREP in achieving the strategic objectives of their workplan. Improved cellular reception will improve neighborhood safety, work efficiency and overall access to affordable technology.

BluEarth employees also volunteer their time, energy and resources to causes and programs that strengthen the communities where we live and work. Some examples of volunteering include building garden boxes for the Lennox & Addington Stewardship Council's pollinator program in Ontario, participating in the annual shoreline cleanup in North Vancouver with our BC operations team, participation by our Bow Lake wind operators in the Batchewana First Nation parade, and coordinating STARS training with the local Chauvin Volunteer Fire Department and our Bull Creek wind operations team. These are just a few examples of ways that BluEarth employees contributes to the local communities where they work and provide ideas of how OTW LP can be involved in local community initiatives should the Project be successful in this Request for Proposals.

Specific to the Project community, OTW LP has donated to local organizations for several years including the Nature Conservancy of Canada Big Muddy Property for trail improvements and native vegetation conservation. OTW LP has and will continue to donate funds and employee time to support local food drives and food banks as these are important resources for vulnerable populations in the Project area.

7.0 Scholarship Programs

BluEarth has established a corporate scholarship program that is designed to support, educate and inspire the next generation of leaders and professionals who have the power to change the future. BluEarth has three scholarship categories available to inspiring students, with preference given to applicants that originate from within its project areas:

- **Indigenous Peoples** – BluEarth is committed to building mutually-beneficial relationships with Canada's Indigenous communities. As part of this commitment, BluEarth awards scholarships to Indigenous students to help develop their skills and knowledge in the renewable energy sector.
- **Community Leaders** - Building strong communities relies on many people. This scholarship is awarded to students who demonstrate a commitment to giving back to their community and making the world a better place for their generation and generations to come.
- **Renewable Energy Trades** – BluEarth is committed to helping grow the renewable energy sector and supporting the skilled workers who will lead the way. This scholarship is awarded to students enrolled in a renewable energy trades program.

BluEarth's scholarship program is open to residents of Canada or the United States but a key component of the selection process is to consider applicants who are in proximity to the locations where employees live, work and operate. In addition to BluEarth's corporate scholarship program and to ensure at least one resident of the local Project area benefits, OTW LP will create a new scholarship to support either:

- Local residents transitioning from employment at the coal mine and power station to a career in renewable energy, or

- Graduating students of Coronach and area schools who are poised to work in renewable energy and who want to stay in the local area.

8.0 Landscape Sustainability Benefits

BluEarth and OTW LP recognize that community benefits extend beyond the human environment and also represent enhancing the sustainability of the natural landscape and its ecological value to the community. Sustainability efforts are a key focus at BluEarth and one way that it contributes to these efforts at project sites are through habitat enhancement initiatives. In recognition of its commitment towards sustainability, BluEarth was named one of Canada's Greenest Employers in 2020.

At BluEarth's operating renewable energy facilities, it has been able to incorporate pollinator friendly re-vegetation and reclamation following construction, install bee and bat houses within the projects, plant trees to help provide habitat as well as install wetland connectivity crossings for species in the area. Below in Figure 1 are highlights from BluEarth's sustainability initiatives in 2019, which demonstrate some of the community benefits it was able to provide in the communities where employees live and operate projects. Specific to the Project area, BluEarth has identified the following possible landscape sustainability initiatives that team members will participate in should the Project be successful:

- Trail maintenance and native species planting within the Big Muddy Property managed by the Nature Conservancy of Canada
- Tree planting and invasive species management in Poplar River Community Park in Coronach

9.0 Other Benefits

9.1 Provincial Opportunities

OTW LP is aware that the Province of Saskatchewan has invested $10 Million to support the transition of communities away from coal to cleaner sources of energy. According to recent news articles, the Town of Coronach will benefit from $2 million of this funding spaced evenly over three years, beginning in 2020. Further details of the intended investment of these funds is unclear, but OTW LP will explore options to create synergies with local recipients of these funds to maximize the overall community benefits of this Project.

9.2 Federal Opportunities

On October 1, 2020, the Prime Minister announced $10 billion in new major infrastructure initiatives to create jobs, economic growth and help build a low-carbon future. The Canada Infrastructure Bank's (CIB) Growth Plan is expected to create approximately 60,000 jobs across the country. The Growth Plan will invest in five major initiatives, of which one of them is $2.5 billion for clean power to support renewable generation, storage and transmission of clean electricity between regions, provinces, and territories. This federal funding is specifically targeted to support clean energy projects to reduce greenhouse gas emissions and help Canada in its 2030 and 2050 emission reductions targets. The CIB has stated that partnerships with public authorities are central to new project opportunities[1]. Outlaw Trail Wind LP believes there is an opportunity for the CIB to finance transmission infrastructure upgrades in Southern Saskatchewan and specifically from the Poplar River thermal power station to support the rapid integration of renewable energy projects in the area. The CIB's Growth Plan will be implemented over the next 24-36 months, which aligns well with SaskPower's required network upgrades to support the current, and future, requests for proposals for wind generation and solar generation facilities.

9.3 SaskPower Value-Add

The Project area hosts a community that is currently supported by local employment and tax revenues from SaskPower's Poplar River thermal generating station that was established in 1981. SaskPower has made significant investments over many years in the electrical generation infrastructure at Poplar River, including the three major 230kV transmission lines that carry electricity from the power plant to other areas of the Province. As the Poplar River power plant is scheduled to close by 2030, this community will be heavily impacted economically. In addition to the economic impact to the community, SaskPower will have significant stranded assets in the form of the generating station and multiple 230kV transmission lines. By awarding the Project a Power Purchase Agreement, SaskPower has an opportunity to use existing infrastructure and to create an economic advantage for itself and the community. If the existing 230kV lines are maintained and network upgrades are made, the transmission infrastructure will encourage and benefit future development of renewable energy projects and ensure the most cost-effective electricity is generated for ratepayers in Saskatchewan.

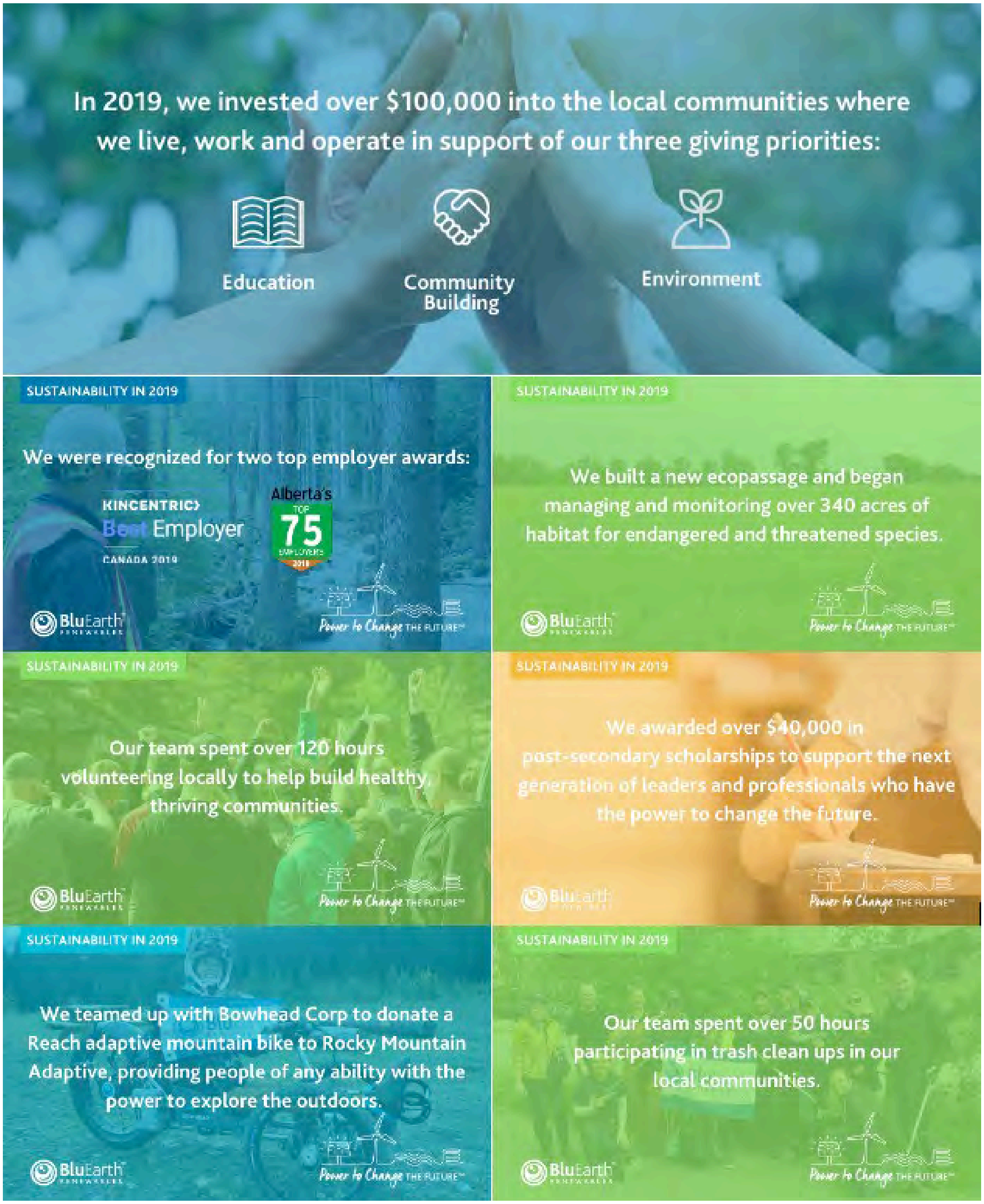
10.0 Summary

Through direct employment, taxes and creation of opportunities for local businesses, in addition to contributions to local initiatives and scholarship programs, OTW LP will provide significant value-added benefits to the Project community. The Outlaw Trail Wind Energy Project will bring substantial benefits to a community that will be materially impacted by the closure of the existing thermal station and associated coal mine. A summary of value-added community benefits is provided below. Although BluEarth has already been contributing to local initiatives, it looks forward to substantially increasing its involvement over the coming years should the Project be successful in this Request for Proposals.

[1] https://cib-bic.ca/wp-content/uploads/2020/10/Summary-of-the-CIB-Growth-Plan.pdf

Initiative	Benefit to Community
Wireless Communications Improvements	OTW LP will facilitate the installation of wireless communications on the Project’s meteorological towers to improve local reception.
Scholarship Program	OTW LP will provide education funding to local residents looking to transition into the renewable sector or students interested in careers in renewable energy.
Resource Development	OTW LP will support efforts to develop community based renewable resource projects, such as roof-top solar installations, through knowledge sharing and in-kind contributions.
Tourism Development	OTW LP will sponsor a roadside turnout information sign to educate tourists about the historic significance of the area and role in the famous Outlaw Trail, as well as erect information boards to educate tourists and the general public about wind energy.
Coronach and Area Food Banks	OTW LP will donate funds and employee time to support local food drives and food banks as these are important resources for vulnerable populations in the Project area.
Landscape Improvements	OTW LP will support, through financial or employee time, trail maintenance and native species planting within the Big Muddy Property managed by the Nature Conservancy of Canada and tree planting and invasive species management in Poplar River Community Park in Coronach.

Figure 1: BluEarth Renewables' 2019 sustainability highlights



K.2 Community Engagement Plan

Outlaw Trail Wind LP

Outlaw Trail Wind Energy Project
Community Engagement Plan

November 2020

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1.0 Introduction

Outlaw Trail Wind LP (OTW LP), a partnership between BluEarth Renewables Inc. and NuWind Energy Corp. (a subsidiary of FHQ Developments), is developing the Outlaw Trail Wind Energy Project (the Project), located approximately 20 kilometres east of the Village of Coronach, in south-central Saskatchewan. To support OTW LP's proposal submission to Saskatchewan Power Corporation (SaskPower) in response to its Request for Proposals issued for the development and operation of a Wind Energy Facility (Inquiry Number: RVS/155(2)), this Community Engagement Plan has been prepared for the Project to fulfill the Section 10.6 and Form 9 requirements.

OTW LP is committed to the engagement and communication with stakeholders, government and regulatory agencies and Indigenous communities throughout all phases of the Project. OTW LP started engagement for the Project in 2015 and will continue to engage until the decommissioning of the Project. Engagement is a way to share information and seek feedback through comments and interest. Public engagement provides the opportunity for locals, stakeholders and other interested parties to review the Project throughout the planning and development stages of the Project. Engagement is intended to be an interactive process that allows the Project to be developed in a way that meets the developer's needs, while respecting various stakeholders' cultures and values by considering concerns and additional benefits to stakeholders. This is accomplished through education, providing information about the Project, and where applicable, modifying the Project design based on responses and concerns raised during the engagement process.

OTW LP has been engaging with the broad Project community for the past five years and will continue to provide multiple opportunities through various venues and methods for stakeholders, government, regulatory agencies and Indigenous communities to participate in the engagement process. Additionally, OTW LP will continue to provide information, feedback, solutions and updates made to the Project that consider comments and concerns from the engagement process.

1.1 Purpose and Goals

OTW LP developed objectives and an approach for the engagement process that included the identification of those individuals or groups that may have an interest or could be affected by the Project. The purpose of the engagement process is to allow these individuals or groups to obtain information, voice their input, and review the Project throughout the planning and development phase.

The goals of the engagement process include:

- Present information on wind energy projects, including construction, operation and maintenance and decommissioning activities;
- Present potential effects of wind projects on human and natural environments;

- Present the specific Project design including location, field study results, schedule and regulatory process and requirements;
- Receive feedback from stakeholders and discuss concerns about the Project;
- Obtain local knowledge on the Project area, as well as additional ideas, concerns and information that could assist in the planning of the Project;
- Inform participants as to how their input and concerns will be considered in the planning of the Project;
- Discuss any modifications made to the Project design throughout the planning process; and,
- Inform participants how additional comments and concerns can be relayed to us and how further information can be obtained throughout the planning and development process.

To achieve these goals, engagement activities to date have been completed through public open house events, direct stakeholder engagement (e.g. meetings with the Saskatchewan Ministry of Environment) and information distribution (e.g. project website and mail-out newsletters). Future planned activities include additional open houses, the development of a community liaison committee, and ongoing identification of stakeholders, consultation and engagement with interested parties.

1.2 Identification of Interested Parties

1.2.1 Stakeholders

Stakeholders were identified as local and regional individuals and organizations that may have an interest in the Project. These stakeholders are believed to be those most directly relevant to the Project and who would be best to involve in influencing decisions about the Project for the greatest benefit of the community. The following initial stakeholder groups were identified:

- Residents and landowners situated within the Project area;
- Landowners located within 2 km of the Project area;
- Rural Municipalities (RM) overlapping the Project area;
- Rural economic partnerships in Southern Saskatchewan;
- Villages, towns and hamlets located within 2 km of the Project area;
- Provincial regulatory agencies;
- Non-government organizations active in the Province of Saskatchewan.

The community engagement process allowed for the identification of additional interested stakeholders. For example, during the engagement process it was identified that an organization called Big Muddy Tours offered guided tours in the area and were interested in learning more about the Project, so they were added to the contact list at that time. The stakeholder list is continually updated throughout the planning and development process, therefore future activities will include continued identification of interested parties and outreach to them.

Non-government organizations (NGOs) identified as stakeholders included:

- Nature Saskatchewan;
- Saskatchewan Environmental Society;
- Ducks Unlimited Canada;
- Nature Conservancy of Canada- Saskatchewan Region;
- Canadian Parks and Wilderness Society – Saskatchewan Chapter;
- Public Pastures Public Interest; and
- Nature Conservancy of Canada

The list of NGOs identified as stakeholders will be reviewed and updated prior to each outreach campaign to ensure that all stakeholders have an opportunity for input.

1.2.2 Indigenous Communities

OTW LP recognizes that the Project is located within Treaty 4 lands and acknowledges the diverse Indigenous communities that inhabit these lands. For the initial consultation process in 2017, Indigenous communities were identified based on geographic proximity to the Project and potential interest in the Project. These Indigenous communities were identified as Wood Mountain Lakota Nation and Willow Bunch Metis Local 139. Additional Indigenous communities may be identified throughout the engagement process and therefore the list is continually updated throughout the planning and development process. The File Hill's Qu'Appelle Tribal Council was also identified as representing multiple Nations including Wood Mountain Lakota Nation across the Treaty #4 territory in southern Saskatchewan.

2.0 Engagement Activity Plan

Since 2015, OTW LP has been consulting and engaging with the broader Project community through active and passive approaches. Active activities include in person meetings, open houses and newsletters, while passive approaches include keeping the project website up-to-date and providing contact information should stakeholders have any questions. OTW LP continues to use a range of engagement methods and tools throughout the planning and development process to make information accessible and provide participation opportunities and feedback for stakeholders, government agencies and Indigenous communities. The consultation and engagement activities completed to date and those planned future activities are detailed in the table and subsections below.

<table>
<tr><th rowspan="2">Engagement Activity</th><th colspan="3">Project Stage</th></tr>
<tr><th>Development</th><th>Construction</th><th>Operation</th></tr>
<tr><td>Active</td><td>- In person meetings
- Open houses
- Indigenous engagement
- Meetings with RMs
- Meetings with SK MOE
- Meetings with NGOs
- Newsletters and handouts</td><td>- Community Liaison Committee
- In person meetings
- Indigenous engagement
- Meetings with RMs
- Newsletters</td><td>- Community Liaison Committee
- In person meetings
- Indigenous engagement
- Meetings with RMs
- Newsletters</td></tr>
<tr><td>Passive</td><td>- Website updates
- Email address and phone number</td><td>- Website updates
- Email address and phone number</td><td>- Website updates
- Email address and phone number</td></tr>
<tr><td>Other</td><td colspan="3">Tracking and Documentation</td></tr>
</table>

2.1 In-Person Meetings

OTW LP completed phone calls and/or in-person visits to landowners, municipal leaders and government ministries and organizations throughout the Project planning and development phase. The objective of this communication was to provide information and allow OTW LP to obtain specific comments and questions from stakeholder groups. The outcome of these in-person meetings was to help gauge the level of interest of the municipalities, to provide Project development updates and to determine which individuals within the region desired to participate in the Project and to sign optioned lease agreements.

Regular in-person meetings with landowners and other parties are planned to continue through the remaining development phase, and throughout the operating life of the Project. These in-person meetings will be opportunities for local residents and local government to engage with OTW LP and influence Project decisions.

2.2 Open Houses

Open houses are held throughout the Project planning and development phases. Open houses allow for sharing of Project information to any interested member of the public, government and regulatory agencies, Indigenous communities and non-government organizations. Open houses allow for the public to learn about the Project and Project specific planning and development activities. Here, individuals are given the opportunity to ask questions and express concerns related to the Project. Comment forms are used to obtain feedback from stakeholders. Attendance is tracked through sign-in sheets at each open house. Open houses are attended by members of the Project team and local environmental consultants, who are available to answer questions, address concerns and discuss the Project.

Three open houses were held in Big Beaver, SK in June 2016, June 2017 and December 2019. Open houses were communicated through advertisements taken out two weeks prior to the event in local newspapers, including the Assiniboia Times, South Central Star and Coronach Triangle. Invitations were mailed out directly to landowners within 2 km of the Project area.

Once the Project is deemed to be moving forward, a schedule for planned open houses and other meetings will be created to ensure timely distribution of information to the public and other stakeholders. This will include a stakeholder meeting following award of a Power Purchase Agreement (PPA) (summer 2021) and prior to the start of the Project construction phase (spring 2022). Additionally, an open house will be planned for local companies, contractors and individuals who are interested in working on the Project construction phase. The Project's prime contractor will participate directly in community events and hold a job fair and local vendor open house prior to construction.

2.3 Meetings with Rural Municipalities and Economic Partnerships

OTW LP has consulted with the Rural Municipalities of Hart Butte and Happy Valley throughout the planning and development process. Updates on Project planning and development were communicated to both RMs through presentations at RM Council meetings in Hart Butte in March 2016, December 2016, December 2017 and February 2019 and in Happy Valley in March 2016, December 2017 and February 2019. In November 2019, OTW LP attended in person meetings at both RMs to provide a project update and obtain signatures required in Form 8 – Community Engagement Checklist of RFQ RVS/155(1). Most recently in July 2020, OTW LP met with RM Councils to discuss the RFP, provide a project update and request written confirmation that the Project is eligible for a disposition for any road allowance under the jurisdiction and control of the RM. At this time, OTW LP obtained feedback and discussed items of interest with the municipalities, such as updated property tax estimates and use of overhead collector lines in the RM road allowance to minimize impacts to native grasslands. The RM's have since provided the written disposition for use of road allowances. OTW LP maintains regular communication with the administrator of both RMs. This engagement plan was shared with both RMs for their review and comment, and RM feedback was incorporated into the final version.

Meetings with the RMs through both attendance at their regularly scheduled council meetings, and creation of special meetings will continue through the life of the Project. A representative of the RMs will be a member of the Community Liaison Committee (see Section 2.7). Going forward, OTW LP plans to meet regularly with the RM Councils and Administrators for consultation and Project update purposes. During the construction period the RMs will be provided with regular updates on progress by the construction team, while once in operation, regular updates will be provided by our Operations Site Supervisor.

OTW LP has had preliminary discussions with the Managing Director of the South Saskatchewan Regional Economic Partnership (SSREP), previously the Deep South Economic Partnership. This partnership was formed as a result of the coal transition and to mitigate economic effects through better positioning member communities to attract new businesses and investment. Member communities include the Towns of Coronach, Willow Bunch, Bengough and Rockglen as well as the RMs of Willow Bunch, Bengough, Happy Valley, Poplar Valley and Hart Butte. The SSREP has five main strategic pillars consisting of organization capacity; workforce transition, retention and attraction; tourism development; resource development and; business retention, expansion and attraction. Further details on how the Project will support the advancement of these five strategic pillars are provided in the Outlaw Trail Wind Energy Project Value-Added Community Benefit Plan submitted under Form 10. OTW LP will continue to engage with the SSREP in 2021 through meetings and emails to ensure they are kept apprised of Project advancement and able to provide feedback.

With the local Westmoreland Mine and SaskPower Poplar River thermal power station facing closure by 2030, the Town of Coronach recently hired an Economic Transition Coordinator to support the development and coordination of various transition initiatives. OTW LP has attended public meetings and had initial discussions with the Coordinator to introduce the Project and benefits for the Town of Coronach. OTW LP is in an excellent position to offset some of the economic impacts of this impending coal plant shutdown through an increase to the tax base, increased use of local suppliers and services, and through short- and long-term employment for Coronach and wider area residents in this coal affected community. Discussions and planning will continue in 2021 to keep the Town apprised of Project developments and share opportunities for input and collaboration on future initiatives.

2.4 Meetings with SK Ministry of Environment

OTW LP has engaged and communicated with SK Ministry of Environment (MOE) through emails, phone calls and meetings where project updates were presented. Six engagement meetings were held between OTW LP and MOE to discuss the Project. These meetings were held on the following dates:

- June 27th, 2016
- March 30th, 2017
- January 18th, 2018
- December 17th, 2018
- April 25th, 2019
- December 11th, 2019

SK MOE will continue to be kept updated on the permit application and development progress of the Project through email and phone calls. Additional consultation meetings with SK MOE will be completed on an as-needed basis throughout the development process. These future meetings may be considered around major project milestones (e.g., completion of the Adaptive Management Plan monitoring components or finalization of a Construction Environmental Management Plan) related to environmental programs.

2.5 Indigenous Engagement

OTW LP continues to engage with the Wood Mountain First Nation and the Willow Bunch Metis Local 139. Information packages including Project description, Project layout and studies completed were mailed out to these Indigenous communities in 2017. Follow up phone discussions were held with the Willow Bunch Metis Local 139 in December 2017. This phone conversation included a discussion about Project location, including siting of the operations and maintenance building and the benefits to the local economy. Additionally, these Indigenous communities received invites to all open houses.

OTW LP plans to engage with other member Nations of the File Hills Qu'Appelle Tribal Council. These consultations will be completed throughout the regulatory phase of project development, through construction, and continue through the life of the Project.

FHQ Developments is the development corporation for the File Hill's Qu'Appelle Tribal Council which operates and invests in multiple companies throughout Saskatchewan. BluEarth has built a strong relationship with FHQ Developments through a common desire to partner on renewable energy-based economic opportunities, beginning when BluEarth provided studies for future solar opportunities on reserve for all 11 Nations. This relationship then turned to focusing on project specific opportunities throughout Saskatchewan for both solar and wind projects. It was in this relationship building and partnership that the opportunity to work on the Outlaw Trail Wind Energy Project came to be.

FHQ Developments is focused on growing its economic impact in Saskatchewan through contributing to the long-term economic independence and prosperity of their Limited Partners and citizens by developing profitable business ventures, economic development opportunities, and advancing employment and livelihood for their Nations and citizens in a manner that is consistent with the Nehiyew (Cree), Dakota, Nakota, Lakota, and Anishinaabe (Saulteaux) Nations teachings. This forward thinking mission allows FHQ Developments the opportunity to focus on the long term sustainability of its businesses.

The relationship that has been built between FHQ Developments through Nuwind Energy and BluEarth is focused on growing the participation and equity of an Indigenous business into a major renewable energy project. This project and the equity that is to be gained through FHQ Developments will create one of the largest Indigenous equity ownerships in renewable energy in Saskatchewan. This coupled with FHQ Developments' focus on creating economic impact in Saskatchewan will see a major overall economic impact to the Saskatchewan economy and a major gain of Indigenous capacity within the industry.

FHQ Developments is ensuring that there is major capacity development through every step of the way from being an equity owner to construction of the project and the maintenance of the assets over 25 years. FHQ companies can deliver on multiple scopes of work, supply Indigenous talent from front line to management, and ensure there is significant reinvestment in the community it operates in, providing a long term, sustainable source of income and opportunity for the member Nations.

2.6 Non-Government Organizations

OTW LP has met with NGOs active in the Province of Saskatchewan. Meetings were a combination of in-person meetings and email correspondence. The initial consultation meetings focused on environmental NGOs to incorporate potential environmental concerns into the planning process. Consulted parties and dates of consultation are listed as follows:

- Saskatchewan Environmental Society – January 28th, 2020
- Nature Saskatchewan – January 29th, 2020
- Public Pastures Public Interest – January 29th, 2020
- Ducks Unlimited Canada (via email correspondence) – January 2 to 20, 2020

Future consultation with non-government organizations will include both environmental NGOs and construction related NGOs in the province and will include the following groups:

- Nature Conservancy of Canada: to discuss potential collaboration with NCC about offsetting options for the Project.
- Saskatchewan Parks and Wilderness Society – SK Chapter: to raise awareness of the Project with this group.
- Saskatchewan Construction Association: to engage with members of this organization and explore opportunities for additional local involvement in the Project.

Consultation with these groups may be held through in-person meetings, current circumstances allowing, or through email correspondence, video conference or telephone conference. Engagement completed to date and future consultation with NGOs will provide them an opportunity to make recommendations on how to improve the Project and participate in its success.

2.7 Community Liaison Committee

Prior to construction initiation, and as part of the community engagement program, OTW LP will develop a Community Liaison Committee (CLC). This CLC will be comprised of community leaders, community members and Project representatives from the development, construction and operations teams and will be a key venue for the community to engage and discuss Project issues.

The CLC will aim to achieve the following objectives:

- To provide a forum for meaningful and open dialogue between local residents, landowners, interested parties and OTW LP on matters related to the Project construction, operation and maintenance, and decommissioning;
- For OTW LP to provide project updates on the Project construction, operation and maintenance, and decommissioning plans/activities including any ongoing studies, mitigation or monitoring activities;
- To facilitate two-way communication and help OTW LP gain a better understanding of any Project-related issues and concerns from local residents, landowners, and interested parties and to receive suggestions that can help make OTW LP a better community partner;
- For OTW LP to review, discuss and respond to comments and questions raised at the previous CLC meeting(s), emailed, or otherwise received by the CLC from members of the community;
- For CLC members to have a venue to offer constructive feedback and reasonable suggestions on local items of interest related to the Project; and
- For OTW LP to assess items brought forward or discussed at CLC meetings and incorporate them, where reasonably appropriate and at OTW LP's discretion, into the construction, operation and maintenance, and decommissioning plans/processes.

The Committee will be formed immediately upon final approval/permitting of the Project and execution of the PPA with SaskPower. Meetings of the CLC will commence prior to construction and will be held at least quarterly during construction and into early operations. This CLC will be a key avenue through which the community and stakeholders will be able to raise concerns, and also influence Project decisions.

2.8 Project Website and E-Mail Address

The Project webpage is available at:

https://bluearthrenewables.com/projects/outlaw-trail-wind-project/

The Project webpage makes information accessible to all interested parties. The webpage features a Project summary, preliminary layout figures, information on the open houses, Project contact information and links to additional information. Details on the open houses include dates and content presented at the open houses including poster boards, frequently asked questions and visual simulations. Additionally, there is a designated Project-specific email address (projects@bluearth.ca) and phone number (1-844-214-2578) to receive comments, feedback and answer questions related to the Project.

The Project website is continually updated with the most current Project information available and will be updated throughout the life of the Project.

2.9 Information Materials and Sources

Information handouts summarizing Project details were made available at the open houses and on the Project webpage. In addition, information packages were mailed to landowners within 2 km of the Project area in May 2017 and July 2020. These information packages included an overview of the Project and an anticipated Project schedule. This information continues to be available to interested parties on the Project website. As the Project is advanced, further information packages will be available at future open house sessions and will be distributed by mail as necessary to ensure that residents, landowners and community members have the most current Project information. Through late-stage development and construction, newsletters will be mailed to local residents and stakeholders on a quarterly basis.

2.10 Tracking and Documentation

The engagement process includes the continuous tracking of interested parties and stakeholders. Contact information was collected and documented in a database that will continue to be updated throughout the life of the Project. This documentation process is a component of the Issues and Grievance Management process, which is further described in Section 4.0.

3.0 Project Impacts and Interest

With the extensive consultation and engagement program to date, OTW LP has received a high level of interest in the Project and prepared a comprehensive list of questions and concerns raised by various stakeholder groups. These questions were answered either directly at the time they were posed, or through follow-up correspondence with additional information. Concerns raised were discussed, and additional information on the topic was provided to the individual stakeholders interested in receiving more details. Answers to many of these common questions and concerns are provided on the Project website for public viewing.

Issues, questions and comments, as well as those individuals or parties interested in the Project, will continue to be recorded and addressed appropriately as an ongoing component of the Project development. This process also forms part of the Issues and Grievance Management process, described in Section 4.0.

3.1 Landowners

Through in-person consultation and open houses, the following impacts and interests have been raised by landowners in the Project area:

- Interest in job opportunities and land lease compensation;
- Concerns about impacts to the acoustic environment through turbine noise;

- Concerns about impacts to their agriculture activities;
- Questions about health effects of wind energy projects;
- Questions about impacts to the visual landscape of a wind project in the local area;
- Questions about soil and groundwater impacts during construction;
- Questions about the specific locations of Project components;
- Questions about potential impacts to local wildlife, such as birds and bats.

3.2 Indigenous Communities

Representatives of the Indigenous communities near the Project and File Hill's Qu'Appelle Tribal Council have expressed the following questions and concerns:

- Questions about how the Project will specifically benefit Indigenous communities in the area;
- Questions about Indigenous employment and sub-contracting opportunities;
- Concerns about archaeological impacts of the Project;
- Concerns about potential impacts to wildlife and hunting.

3.3 Rural Municipalities and Town of Coronach

Through in-person meetings and presentation at Council meetings, the following impacts and interests have been raised by the RMs and Coronach representatives:

- Interest in broad community benefits, specifically municipal tax benefits to the RMs;
- Construction timelines and employment numbers;
- Long-term job opportunities and indirect employment;
- Interest in the Project as a component of the transition to renewable energy;
- Questions about government subsidies for wind energy projects.

3.4 SK Ministry of Environment and NGOs

During in-person meetings with the SK MOE and environmental NGOs, the following questions and concerns were raised about the Project:

- Questions about soil and groundwater impacts during construction;
- Questions about the specific locations of Project components, why components are sited where they are;
- Questions about potential impacts to local wildlife, specifically bird activity levels in the Big Muddy Valley;
- Questions about potential impacts to native prairie and project-specific mitigation plan;
- Questions about archaeological studies and known heritage sites in the Project area;

- Sustainability practices and turbine recycling.

4.0 Issues and Grievance Management

OTW LP uses a specialized engagement tracking software to track community and stakeholder correspondence, issues and concerns throughout the project lifecycle (Borealis). This allows the company to ensure that all discussions, commitments and concerns are tracked and clearly identified. Identified issues and concerns are documented within the software with specific follow-ups/actions assigned to ensure that that the issue and grievance addressed in a timely manner. To date, issues, concerns, comments and questions have been logged and will continue to be logged to document further considerations and actions to be taken.

OTW LP takes issues and grievances from the public seriously and works to address the concern in a timely manner. The company's experience on a wide variety of renewable energy projects across Canada has demonstrated our ability to follow-up and remedy local stakeholder concerns and employ adaptive management were necessary. Should SaskPower be interested, OTW LP can provide examples of where specific stakeholder concerns have been successfully addressed and/or mitigated.

Extensive up-front consultation in the site design stage is a key component to ensuring post-construction issues and grievances against the project are minimized. To the extent possible, the Project is designed to mitigate and minimize the known concerns that were highlighted in the community consultation process and feedback will continue to be incorporated through the detailed design, construction and operation. In the event that post-construction or operational concerns arise that were not previously identified, OTW LP is committed to working with the stakeholder to remedy or mitigate the issue.