

Solar Krafte Utilities Inc.

Spring Coulee Solar Project

Wildlife Assessment Report

REFERENCE NUMBER: B-0053-17



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EXECUTIVE SUMMARY

Basin Environmental Ltd. was retained by Solar Krafte Utilities Inc. to conduct a wildlife assessment at the proposed Spring Coulee Solar Project (the Project). The Project is located in NW-10-4-24 W4M, the northwest half of NE-10-4-24 W4M and in the northwest corner of SW 10-4-24 W4M. The Solar Photovoltaic (PV) facility will generate up to 29.5 megawatt (MW) of electric power that will be added to the Fortis Alberta distribution feeder.

The purpose of the wildlife assessment was to provide information about wildlife species and wildlife habitat found within the proposed Spring Coulee Solar Project development and 1 km buffer. Potential impacts that the Project may have on wildlife species and their habitat will be identified to assist with Project planning, and to avoid, minimize or mitigate potential impacts which the Project may cause.

The wildlife surveys were conducted from April to October 2017 to identify the potential for species at risk to occur within the Project area. Wildlife concerns were identified, through targeted surveys selected from consultation with the AEP Regional Wildlife Biologist, and surveys outlined in the Wildlife Guidelines for Alberta Solar Energy Projects (AEP 2016a). The wildlife surveys that were recommended to target potential species at risk included breeding birds, migratory birds, burrowing owls, sharp-tailed grouse, raptor nests and amphibians.

Three species at risk were observed during the wildlife surveys: barn swallow (*Hirundo rustica*), long-billed curlew (*Numenius americanus*) and trumpeter swan (*Cygnus buccinator*). Habitat utilization within the Project area is low due to the lack of native prairie habitat, suitable wetland habitat for breeding and overwintering, diverse habitat structure and vegetation composition, as well as the existence of suitable habitat in surrounding land. Therefore, habitat loss for the observed species as well as those that have been previously documented within the 1 km buffer will be low as a result. Although the Project area is currently used for foraging by breeding and migrating birds, the unavailability of permanent habitat structures like mature trees, and the presence of wetland disturbances and ongoing agricultural practices limit the availability of nesting and breeding habitat for species at risk and other wildlife. Therefore, siting the Spring Coulee Solar facility on previously disturbed land minimizes potential impacts to wildlife.

Three wetlands were identified along the southern boundary of the Project area, adjacent to Highway 5; two ephemeral wetlands (Wetlands 1 and 2) and a seasonal wetland (Wetland 3). Solar Krafte was unable to avoid all three wetlands, however, Wetland 3 will be avoided by a 50 m setback. The reduced setback is not expected to increase the risk to wildlife due to ongoing

disturbances from vehicular traffic along Highway 5 as well as a lack of emergent vegetation and water depth suitable for nesting and overwintering habitat.

To ensure the risk to wildlife is low during construction and operation, the mitigation measures outlined in Section 5 will be in place to eliminate or minimize potential impacts. An experienced environmental professional will be on site to monitor construction of the Spring Coulee Solar Project to ensure that the mitigation measures are in place and are being followed, to ensure the safe relocation of any potential wildlife (with AEP's approval) that may be encountered during construction, and to ensure that all of the applicable environmental laws and regulations are being followed.

Wildlife habitat within the Project area is low due to ongoing disturbances from agricultural cultivation activities, traffic, a lack of native grassland habitat and suitable wetland habitat, a lack of habitat structure and vegetation composition, and the availability of suitable wildlife habitat outside of the Project area. Therefore, siting the Spring Coulee Solar Project within the proposed Project area, and ensuring the appropriate mitigation measures are in place, minimizes potential impacts to sensitive wildlife habitat and species at risk due to Project activities.

To determine the effectiveness of the mitigation measures established during construction and operation, wildlife biologists will conduct post-construction monitoring of the facility for a minimum of three years once the facility is operational, to identify any ongoing impacts or risks to wildlife. Wildlife surveys will be conducted on an annual basis to document wildlife mortality, determine carcass persistence and searcher efficiency, and to monitor potential impacts that the Spring Coulee Solar Project may have on species at risk, sensitive species and other wildlife.

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1.0 INTRODUCTION

1.1 PROJECT OVERVIEW

Solar Krafte Utilities Inc. (Solar Krafte), Belectric and innogy SE propose to permit, construct and operate the Spring Coulee Solar Project, a 29.5 megawatt (MW) Solar Photovoltaic (PV) facility located approximately 9 kilometres (km) southwest of Spring Coulee, Alberta (the Project). The Project is located in the White Area of Alberta in NW-10-4-24 W4M, the northwest half of NE-10-4-24 W4M and in the northwest corner of SW 10-4-24 W4M (Figure 1).

1.2 PROJECT DESCRIPTION

The Project will consist of flat, single access trackers with solar PV modules set up in a north/south direction to allow the solar PV system to track/ tilt on a single axis with the sun in an east to west direction. Computer controlled electric motors will power the trackers. The Project will transfer electric power generated by the solar PV system through underground cables and directly into 25 kilovolt (kV) Fortis Alberta distribution feeders located on the roadway. One Class VI access road will be constructed from Township Road 42 to allow access to the electrical inverters. The Spring Coulee Solar Project will encompass an area of approximately 80 hectares (ha), however, the proposed footprint consisting of the solar arrays, inverters and access roads will only be 27.8 ha. Construction of the Project is anticipated to occur between October of 2018 and September of 2019.

The specific make and model of the solar PV modules have not yet been identified. However, the total number of modules installed is not expected to exceed 295,000, and given advancement in solar PV technology, it is expected that the impacted area may be reduced prior to commercial operation. For the design reference case, the Project is using 292,620 First Solar FS-4120-3 modules. These modules are 1.2 meters (m) in length and 0.6 m in width, and each produces 120 watts of DC power. The modules are mounted 4 wide on the tracker, for a total array width of 2.54 m. The module racking allows for small gaps between the modules, ergo individual drip edges, thus no material impact on storm-water attenuation. The trackers are installed 3.81 m apart.

Basin Environmental Ltd. (Basin) was retained by Solar Krafte to conduct a wildlife assessment of the proposed Spring Coulee Solar Project. In accordance with Alberta Utilities Commission (AUC) Rule 007 (AUC 2016), the Wildlife Assessment Report will be submitted to Alberta

Environment and Parks (AEP) for review and sign off. AEP will issue a *Wildlife Renewal Energy Referral Report* to be submitted with the application to the AUC.

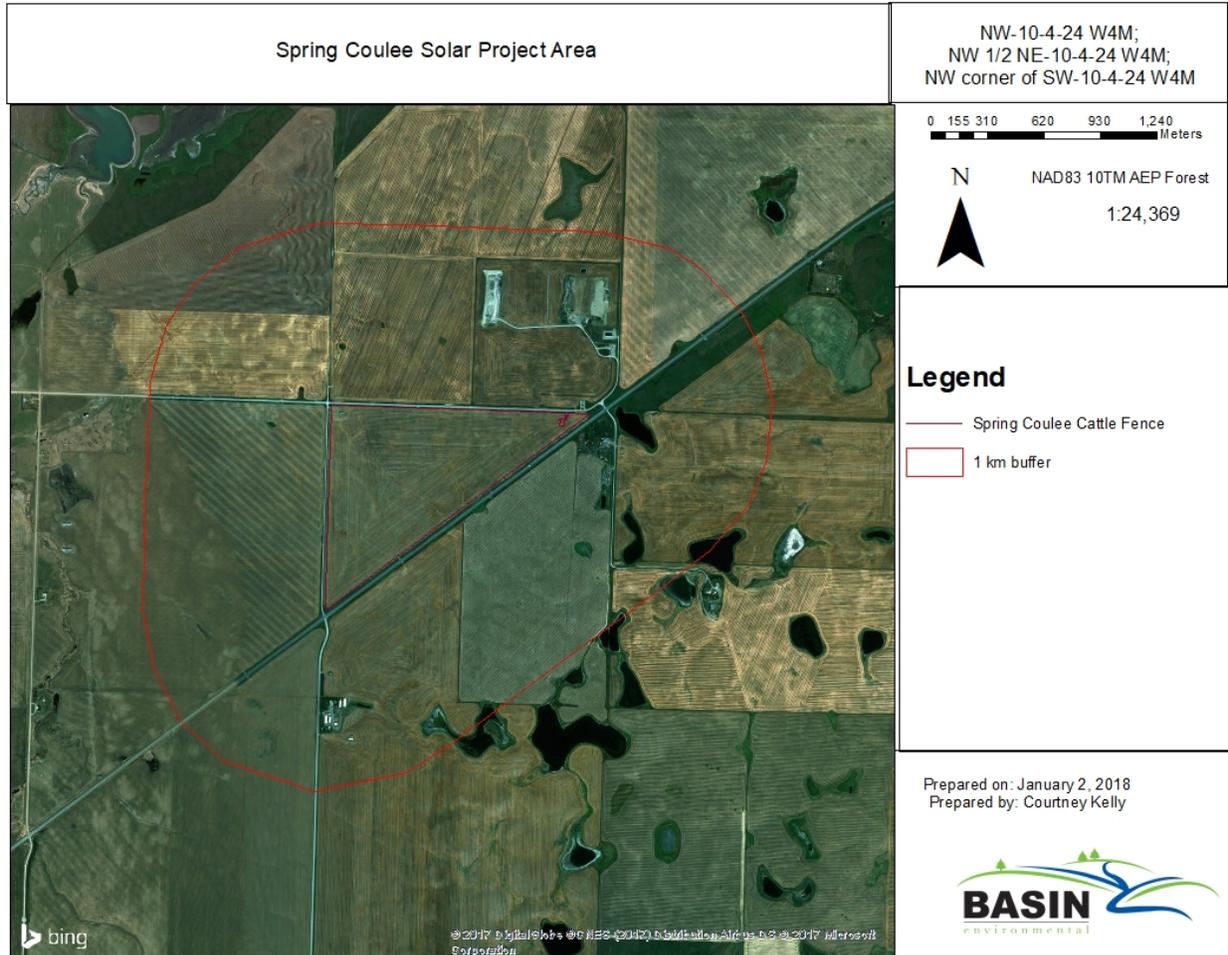


FIGURE 1. LOCATION OF THE SPRING COULEE SOLAR PROJECT WITHIN ALBERTA

1.3 PURPOSE

The purpose of the wildlife assessment was to provide information about wildlife species and wildlife habitat found within the proposed Spring Coulee Solar Project development.

. Potential impacts that the Project may have on wildlife species and their habitat will be identified to assist with Project planning, and to avoid, minimize or mitigate potential impacts which the Project may cause.

Preliminary consultations with the regional biologist with Alberta Environment and Parks (AEP) outlined the potential for species at risk to occur within the Project area. To assess the potential for wildlife concerns it was determined that the following surveys would be conducted: breeding bird surveys, migratory bird surveys, burrowing owl surveys, sharp-tailed grouse surveys, raptor nest surveys, and amphibian surveys.

For this assessment, wildlife species at risk were defined as:

- Species listed in Alberta’s general assessment as ‘At Risk’, ‘May Be at Risk’ and ‘Sensitive’ (AEP 2017a).
- Legally designated species listed under the Alberta *Wildlife Act* as ‘Endangered’, ‘Threatened’ and ‘Special Concern’ (AEP 2015).
- Species listed in Schedule 1 of the *Species at Risk Act* (Government of Canada 2017).
- Species listed as ‘Endangered’, ‘Threatened’ and ‘Special Concern’ under the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (Government of Canada 2017).

1.4 REGULATORY SETTING

Potential impacts on wildlife and wildlife habitat are subject to provincial and federal legislation as well as approval from AEP as per Rule 007 (AUC 2016).

1.4.1 *MIGRATORY BIRDS CONVENTION ACT*

The *Migratory Birds Convention Act (MBCA)* protects and conserves migratory bird populations, individuals, and their nests. The *MBCA* is administered by Environment and Climate Change Canada (ECCC) through the Canadian Wildlife Service (CWS) and applies to the following migratory birds (refer to Environment Canada 1991 for the full list of species protected by the *MBCA*):

- Songbirds (e.g., swallows, robins, woodpeckers)
- Waterfowl (e.g., ducks, swans, loons)
- Shorebirds (e.g., sandpipers, killdeer)
- Cranes (e.g., herons, egrets)

Section 6 of the Migratory Bird Regulations prohibits the disturbance, destruction, or removal of a nest, egg or nest shelter of a migratory bird. Section 5(1) of the *MBCA* prohibits the deposition

of oil, oil wastes, or other substances harmful to migratory birds in any waters or any areas frequented by migratory birds.

CWS does not issue permits or authorizations for the removal of migratory birds, their nests or eggs, therefore mitigation measures and best management practices identified in Section 5.0 should be followed to prevent contravention of the *MBCA*.

1.4.2 SPECIES AT RISK ACT

The *Species at Risk Act (SARA)* is a key tool for the protection and conservation of Canada's biological diversity and native species. The goal of *SARA* is to prevent wild species from becoming extinct or extirpated; to aid in the recovery of species at risk; and, to ensure species listed as 'Special Concern' do not become endangered or threatened (Government of Canada 2017).

COSEWIC assesses, designates the status of a species and recommends the species for legal designation under *SARA*. Those species added to the List of Wildlife Species at Risk (Schedule 1) are protected from the following offenses under *SARA*:

- “To kill, harm, harass, capture or take an individual;
- to possess, collect, buy, sell or trade an individual or any part of an individual; and,
- to damage or destroy the residence (e.g., nest or den) of one or more individuals”.

Although species listed as 'Special Concern' are protected in part through management plans, none of the above restrictions apply to these species.

SARA also has a provision to protect 'critical habitat' which is necessary for the survival and/or recovery of a species at risk. If clearing and construction are expected to destroy 'critical habitat' for a species listed in Schedule 1, potential regulatory requirements may need to be met depending on jurisdiction and land ownership.

1.4.3 ALBERTA'S WILDLIFE ACT

The *Wildlife Act* and *Wildlife Regulation* provide the legislation and regulatory provisions to protect and manage wildlife in Alberta. The Minister responsible for Fish and Wildlife Management has the authority under the *Wildlife Act* to influence and control human activities that may have direct adverse effects on the populations and habitat of wildlife species. The *Wildlife Act* [Sec. 103 (1) (u)] enables the Minister to establish regulations, “...*respecting the protection of wildlife habitat and restoration of habitat that has been altered, and enabling the*

Minister to order persons responsible for the alteration to restore the habitat and to charge them with the cost of it if they have failed to affect the restoration.”

The Scientific Subcommittee (SSC) of the Endangered Species Conservation Committee (ESCC) reviews detailed status reports for species listed with a general status of ‘At Risk’ or ‘May Be at Risk’. The ESCC provides recommendations to the Minister of AEP who then determines if the species will be legally designated (e.g., Endangered or Threatened) under the *Wildlife Act*. Schedule 6 of the Wildlife Regulation lists the species that are legally designated.

Section 36(1) of the *Wildlife Act*, states that: “A person shall not willfully molest, disturb or destroy a house, nest or den of prescribed wildlife or a beaver dam in prescribed areas and at prescribed times”. Therefore, no one will hunt, disturb or harm wildlife without a permit (*i.e.*, hunting licence or collection permit). The proponent understands that the Wildlife Renewable Energy Referral Report does not grant permission to disrupt or kill wildlife, and that all wildlife whether dead or alive, are the property of the Crown.

Those bird species that are not protected under federal legislation are protected by the *Wildlife Act* and include upland game birds (*e.g.*, grouse, quail, pheasants, ptarmigan), raptors (*e.g.*, hawks, owls, eagles, falcons), cormorants, pelicans, crows, jays, kingfishers and some blackbirds.

1.4.4 GENERAL STATUS OF ALBERTA WILDLIFE SPECIES

The General Status of Alberta’s Wild Species is a report that is generated every five years as new knowledge and research becomes available, the last one was completed in 2015 (AEP 2017a). The report details the status listing of all of the vertebrate species in Alberta determined by evaluating population trends, abundance and distribution, and threats to a species and habitat.

The Recommended Land Use Guidelines for Protection of Selected Wildlife Species and Habitat within Grassland and Parkland Natural Regions of Alberta (Alberta Government 2011) identifies specific restricted activity periods and disturbance setback distances for select wildlife species.

1.4.5 WILDLIFE DIRECTIVE FOR ALBERTA SOLAR ENERGY PROJECTS

The new Wildlife Directive for Alberta Solar Energy Projects (AEP 2017b) provides standards and recommendations for solar energy projects in Alberta to avoid, minimize or mitigate risk to wildlife and wildlife habitat during the siting, construction and operational phases. The Directive is an update of the Wildlife Guidelines for Alberta Solar Energy Projects (AEP 2016a) which

previously described the pre-construction survey requirements and the post-construction monitoring requirements for solar projects in Alberta.

The Directive, in conjunction with consultation with the Regional AEP Wildlife Biologist, details the required wildlife surveys necessary to provide baseline data for each solar energy project. All wildlife surveys are required to follow the methods outlined in the Sensitive Species Inventory Guidelines (Alberta Government 2013), unless otherwise specified by Regional AEP Wildlife Biologist, and are to be conducted within the Project area, and a 1 km buffer surrounding the Project area. Results from the pre-construction wildlife surveys are valid for a period of 2 years. Should construction and operation not occur within 5 years, then new pre-construction surveys are required.

Risks that are unable to be avoided or minimized are addressed in a construction and operation mitigation plan where site- and/or species-specific mitigation and timing restrictions are outlined. To assess the effectiveness of the recommended mitigation, post-construction wildlife monitoring will be conducted to identify any ongoing wildlife risks from the operation of the solar energy project. A post-construction monitoring and mitigation plan will evaluate and identify the solar energy project's impacts on wildlife over a period of 3 years. If high levels of risk to wildlife are found during the monitoring surveys, then mitigation measures outlined in the plan will be implemented and/or acceptable alternatives developed in consultation with the Regional AEP Wildlife Biologist, and a further 2 years of monitoring will occur to ensure the measures are successful in minimizing risk to wildlife.

1.4.6 AUC RULE 007

Approval under AUC Rule 007 - Applications for Power Plants, Substations, Transmission Lines, Industrial System, Designations and Hydro Developments (AUC 2016) is required to alter, construct, connect or operate power plants, substations and transmission lines and industrial systems designations.

The wildlife assessment has been completed following the Wildlife Directive for Alberta Solar Energy Projects and will be submitted to Kristin Cline, AEP's Renewable Energy Projects Wildlife Biologist, for Approval. Once approved, AEP will issue a signed copy of the *Wildlife Renewable Energy Referral Report* to Solar Krafte for submission with their application to the AUC.

2.0 METHODS

2.1 DESKTOP REVIEW

Prior to the field assessments, background information and environmental data was reviewed to identify wildlife species and wildlife habitat within the Project area and within a 1 km buffer of the Project area. The following sources were used for the desktop review:

- Aerial imagery (Google Earth Pro 2017)
- Alberta Biological Monitoring Institute (2014)
- Alberta Atlas of Breeding Birds (Federation of Alberta Naturalists 2007)
- Environmentally Significant Areas (Fiera Biological Consulting Ltd. [Fiera] 2014)
- Alberta Wild Species Database (AEP 2017a)
- eBird Canada (2017)
- Environment Canada's Bird Conservation Regions (Environment Canada 2013)
- Fish and Wildlife Management Information System (FWMIS) (AEP 2017c)
- FrogWatch Alberta (NatureWatch 2017)
- Important Bird Areas (IBA) (Bird Studies Canada 2017)
- Landscape Analysis Tool (Government of Alberta 2017)
- *Species at Risk Act* Public Registry (Government of Canada 2017)

2.2 WILDLIFE SURVEYS

The wildlife surveys targeting potential species at risk were determined through consultations with Brandy Downey, Senior Species at Risk Biologist at AEP, in addition to the surveys outlined in the Wildlife Guidelines for Alberta Solar Energy Projects (AEP 2016a). At the time of scoping the field surveys, the Wildlife Directive for Alberta Solar Energy Projects (AEP 2017b) had not yet been issued.

Wildlife surveys were conducted between April and October 2017 in accordance with the methods outlined in the Sensitive Species Inventory Guidelines (Alberta Government 2013), unless otherwise discussed with the AEP Wildlife Biologist. The surveys targeted breeding birds, migratory birds, sharp-tailed grouse (*Tympanuchus phasianellus*), burrowing owls (*Athene cunicularia*), raptor nests and amphibian species. Incidental wildlife species observed during the surveys were also recorded. Survey station locations are identified in Figure 2.

Wildlife surveys were conducted by Basin biologists Courtney Kelly, B.Sc., P.Biol., and Dan Cooper, B.Sc., B.I.T; both of whom are experienced wildlife biologists. All wildlife observed were identified to species, where visually possible, and the location of wildlife habitat was recorded using a handheld Garmin GPS map 64s. Where necessary, and to minimize disturbance, binoculars and a spotting scope were used to identify wildlife species observed outside of the biologist's visual range as well as in areas where Basin did not have landowner permission.

2.2.1 BREEDING BIRD SURVEYS

Breeding bird surveys were conducted following the point-count survey method outlined in the Sensitive Species Inventory Guidelines (Alberta Government 2013). Three survey stations, S-1, S-2 and S-3, were established throughout the Project area, approximately 900 m apart. Each station was geo-referenced and the weather conditions, time of survey and locations were recorded. Other data recorded included the number of species observed, the direction and estimated distance to the bird, and observed wildlife habitat (e.g., nests).

When conducting the breeding bird surveys, the timing windows outlined in the Wildlife Guidelines for Alberta Solar Energy Projects (AEP 2016a): early species (May 1 to June 15) and late species (June 16 to July 15) were utilized. To capture grassland bird species throughout the spring breeding season, the early spring breeding bird survey was conducted on May 3, 2017 from 0600 to 0700 and the late spring survey was conducted on June 20, 2017 from 0725 to 0800. At each survey station, a 3 to 5 minute passive survey was conducted and all bird species heard or seen were recorded within a 100 m radius. Other data recorded included the number of species observed, and the direction and estimated distance to the bird. Species observed outside of the 100 m radius were also noted.

2.2.2 MIGRATORY BIRD SURVEYS

Migratory bird surveys were conducted using a modification of the point-count survey method outlined in the Sensitive Species Inventory Guidelines (Alberta Government 2013). Three survey stations, S-1, S-2, and S-3, were established throughout the Project area, approximately 900 m apart. Each station was geo-referenced and the weather conditions, time of survey and locations were recorded. Other data recorded included the number of species observed, the direction and estimated distance to the bird, and observed wildlife habitat (e.g., nests).

The migratory bird surveys were conducted in the morning hours to target songbirds, and in the late afternoon to target raptors and migrating waterfowl. Surveys were conducted for a total of 20 minutes at each survey station, as per standard protocols, and all bird species detected visually

and/or by call/song within a 500 m radius were identified to species and recorded. The experienced wildlife biologists used spotting scopes and binoculars to increase the likelihood of observing birds within the 500m. Given the featureless, flat terrain it was possible for observers to identify birds within this search radius. Other data recorded included the number of species observed, the direction and estimated distance to the bird, and observed wildlife habitat (e.g., nests). Species observed outside of the 500 m radius were noted as incidental species.

Spring migratory bird surveys were conducted on April 5 (early), 18 (mid), and May 3, 2017 (late) in the morning from 0700 to 0900 and in the late afternoon from 1620 to 1730. Fall migratory bird surveys were conducted on August 31 (early), September 26 (mid) and October 23, 2017 (late) in the morning from 0730 to 0930 and in the late afternoon 1550 to 1700.

2.2.3 SHARP-TAILED GROUSE SURVEY

A visual ground survey was conducted on April 5 and May 3, 2017 to identify potential lek sites and the presence of individual sharp-tailed grouse and their habitat. Observers arrived at the Project location 30 minutes prior to sunrise and during this period of low light, observers listened for sharptailed grouse vocalizations. At sunrise, observers scanned the Project area and 1 km buffer for sharptailed grouse activity as light conditions improved. At each survey location the following data was recorded: date, start and end time, weather (cloud cover, temperature, wind speed, precipitation), and survey locations were recorded using a handheld GPS. Sharp-tailed grouse surveys were completed within the appropriate time period and weather conditions recommended in the Sensitive Species Inventory Guidelines. Sharp-tailed grouse surveys were completed for 15 minutes, and ended no later than 3 hours after sunrise.

2.2.4 BURROWING OWL SURVEY

Burrowing owl surveys were conducted within the Project area and within the recommended 500 m setback, where Basin had landowner permission or could access public roads. The burrowing owl surveys consisted of two methods, the call back method and the ground search method, which were used to observe and locate burrowing owls and their nests. Four survey stations were established within the Project area. The stations were geo-referenced and the weather conditions, time of survey and location were recorded. Binoculars and a spotting scope were utilized to further identify any individual species and to determine activity if a nest was observed.

A call-playback survey was conducted on May 18, 2017 between 0645 and 0810. Each callback survey was conducted for a total of 7 minutes. At each survey station, the field crew waited for

approximately 3 minutes for the owls to adjust from the noise of their arrival. Once the 3 minutes was complete, the call of the burrowing owl was played for a period of 3 minutes using a wildlife caller set to 80 dB. The caller was rotated 360° to ensure calls were broadcasted throughout the entire circumference of the survey area. The field crew watched for owls throughout the entire 3 minute period, and then passively observed for 1 minute. Location, abundance and age were recorded for any observed owls.

A ground search was conducted on May 18 and 22, 2017 after the completion of the call-back survey, to search for potential nests/burrows. The field crew began the search from the centre of the survey area and walked in concentric circles until they reached 100 m. All burrows with an opening of greater than 10 centimetres (cm) were investigated for sign (*e.g.*, whitewash, feathers, pellets, prey bones or loose soil). Any observed burrows were geo-referenced using a handheld GPS and the number of adults, young of the year and nest status were recorded in the field notes. If an active burrow was located, its activity status was recorded.

2.2.5 RAPTOR NEST SURVEY

Prairie raptor nest surveys were conducted within the Project area and the 1 km buffer on April 5 and May 3 2017. A spotting scope and binoculars were used to scan the Project area and the 1 km buffer, and all observed raptor species and nests were recorded. Data recorded on individual raptors observed included behaviour (*e.g.*, perching, flying or nesting), number, life stage (*e.g.*, fledgling, juvenile or adult), and sex (if known).

2.2.6 AMPHIBIAN SURVEY

Auditory surveys were not conducted during the amphibian breeding season as there were no areas of standing water and the wetlands were dry at the time of assessment. A visual survey was conducted on foot on April 20, 2017 to search for egg masses, tadpoles and adult amphibians along the shallow edges, aquatic vegetation, and substrate of all moist areas within the Project area and 100 m of the Project boundary, where Basin had landowner permission. All observations were recorded. The target species for this survey included the plains spadefoot toad, great plains toad, and northern leopard frog; however, all amphibian species observed were recorded.

As northern leopard frogs are difficult to detect during auditory surveys, Basin consulted with AEPs wildlife biologist to determine that a visual survey for northern leopard frog should occur in August due to the increased likelihood of a successful observation.

Basin’s experienced wildlife biologists conducted the visual survey for northern leopard frogs on August 22, 2017. The survey was conducted for a minimum of 20 minutes at all waterbodies with standing and/or flowing water when temperatures ranged between 10°C and 25°C. The date, start and end time, weather, temperature (air and water), wind speed, water color and turbidity, substrate and vegetation were recorded. The shallow water zone and shore zone were surveyed by walking at a constant speed around the wetland, and a meter stick was used to flush frogs from potential vegetated habitats. All species observed, including incidental species, as well as their life stage were recorded.

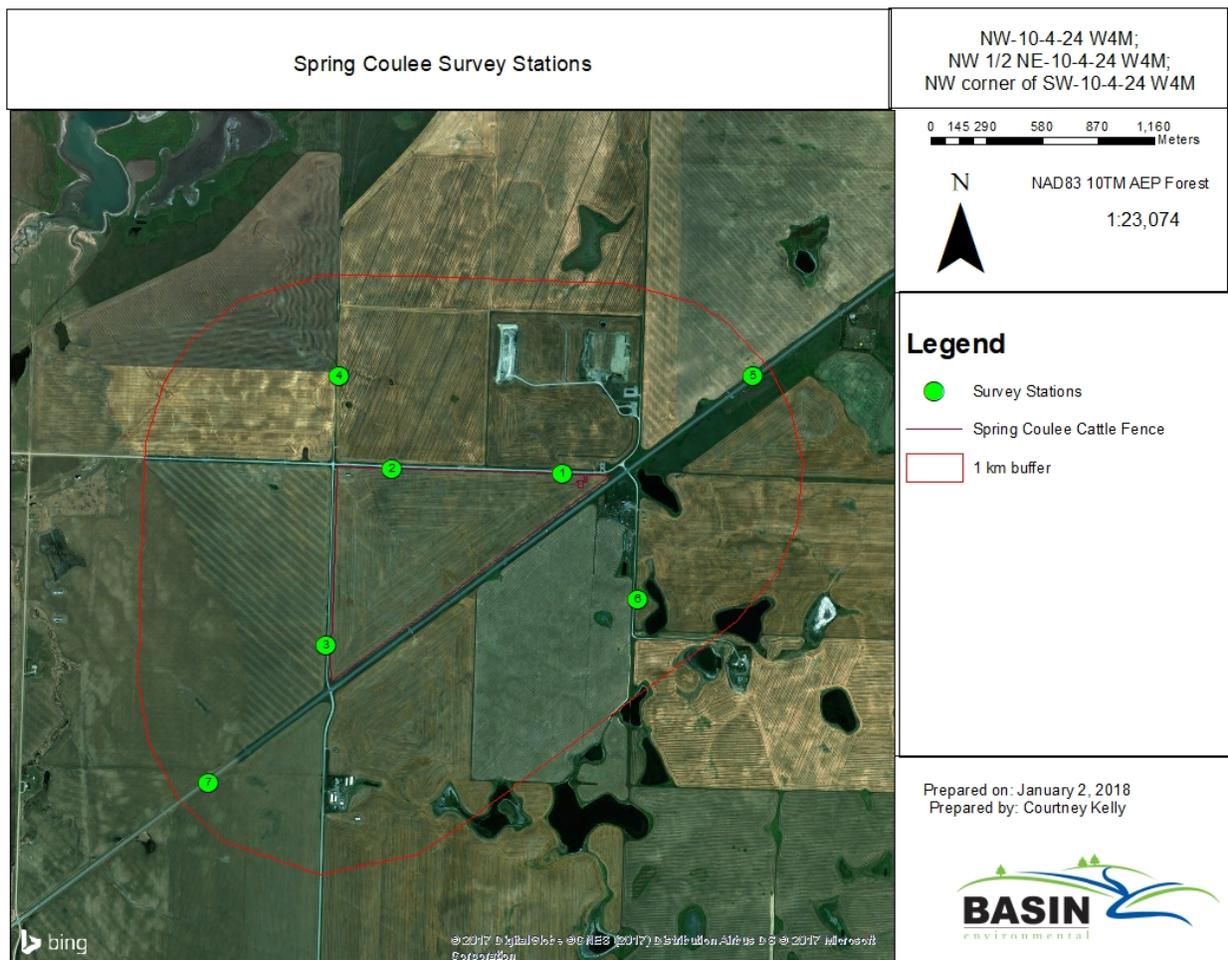


FIGURE 2. LOCATION OF WILDLIFE SURVEY STATIONS WITHIN THE PROJECT AREA AND 1 KM BUFFER

3.0 RESULTS

3.1 DESKTOP REVIEW

3.1.1 WILDLIFE HABITAT OVERVIEW

The Project is located within the Foothills Fescue Natural Subregion of the Grassland Natural Region (Natural Regions Committee 2006). The Grassland NR, also known as the prairies, is the driest, warmest and most fertile region in Alberta. Distinct habitats in this region include sand plains, dune fields, rocky outcrops and the badlands which provide important breeding habitat for species at risk and local wildlife (Alberta Parks 2014). The Foothills Fescue Natural Subregion occupies an irregular south-north belt between 15 to 100 km wide, extending north from the Alberta–Montana border to northwest of Drumheller. Surficial materials are dominantly medium textured, moderately calcareous glacial till. Soils are dominated by Orthic Black Chernozems with Dark Brown Chernozems occurring on exposed southern slopes and in wind eroded farmlands, and some saline soils on irrigated plains. Vegetation is characterized by grass dominated communities such as parry oat grass and bluebunch fescue, as well as shrubby cinquefoil, particularly on grazed sites. One percent of this Subregion is occupied by open water, with three percent occupied by wetlands. Agriculture forms the dominant land use in this Subregion (Natural Regions Committee 2006).

Land use within the Project area consisted of primarily agricultural crop cultivation and two residences. The entire project area, including the 1 km buffer, was assessed for native habitat, where accessible. No native grassland habitat or rare plant species were observed. Vegetation along the field margins consisted primarily of disturbance species (i.e., non-native and weed species) and would not qualify under the definition of native grassland. Refer to Figure 3 for the habitat cover type within the 1 km buffer. It should be noted that Basin did not have permission to enter lands within the 1000 buffer but all attempts were made to observe habitat and species within the buffer through access on public roads.

Three wetlands were identified within the Project area, all of which have been previously disturbed by agricultural practices which has resulted in the removal of all wetland-dependent vegetation species, organic surface matter and soil horizons (Basin 2017). Wetlands 1 and 2 were partially cultivated and classified as ephemeral wetlands and Wetland 3, which has been completely cultivated, was classified as a seasonal wetland.

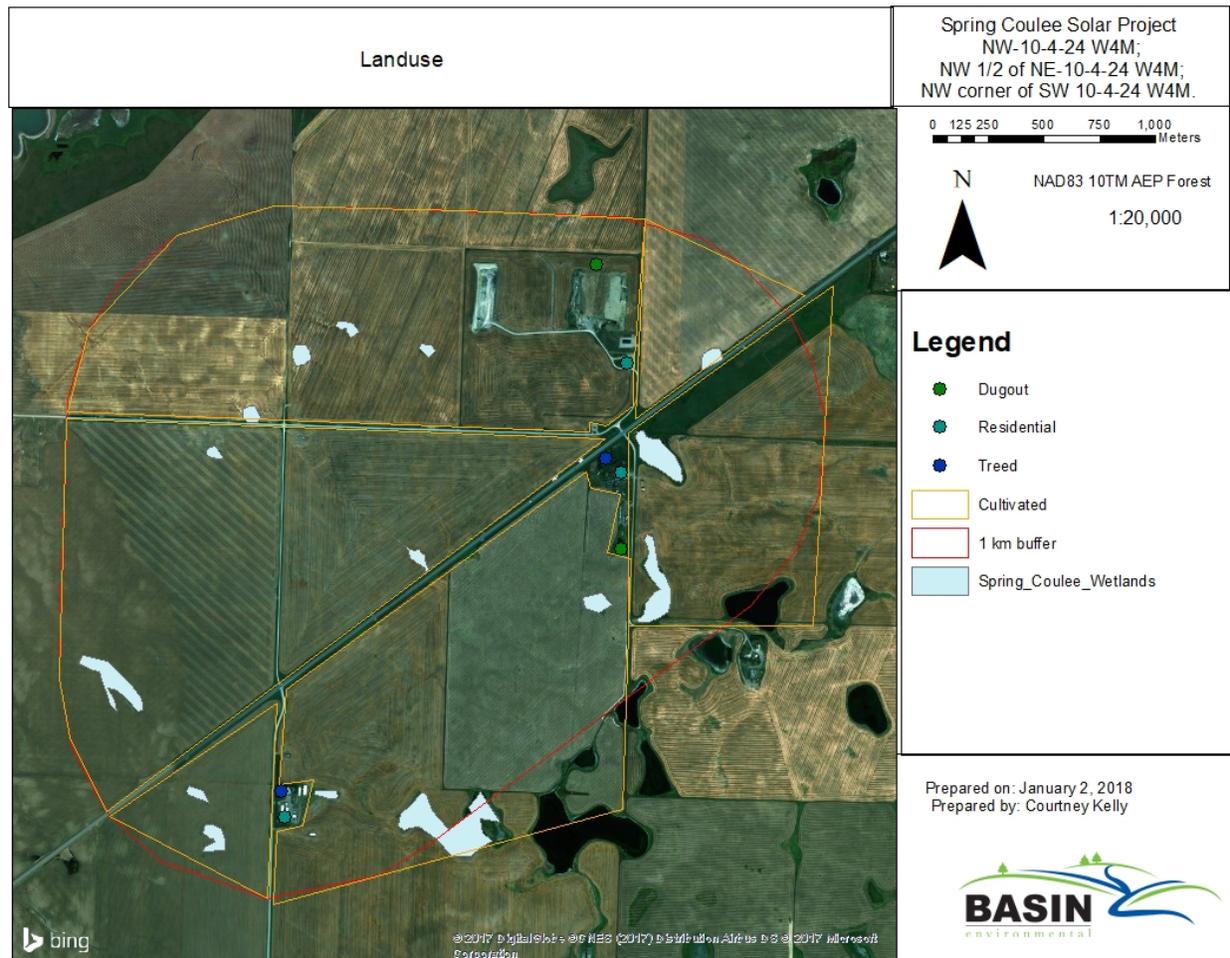


FIGURE 3. HABITAT COVER TYPE WITHIN THE PROJECT AREA AND THE 1 KM BUFFER

3.1.2 ENVIRONMENTAL SENSITIVITIES

Sensitive features that overlap the Project area include the Sharp-tailed Grouse Survey Area; Sensitive Raptor Range (i.e., bald eagle, ferruginous hawk, golden eagle, peregrine falcon and prairie falcon); and Other Sensitive and Endangered Species (Government of Alberta 2017). The Project is not located within any Key Wildlife or Biodiversity Zones; however, the St. Mary River, located approximately 7.0 km southwest of the Project area, is a Key Wildlife and Biodiversity Zone. The Project is also located within Bird Conservation Region 11 which provides critical migratory and breeding habitat for waterfowl and over 200 bird species (Environment Canada 2013).

The Project does not occur within any Important Bird Areas (IBA); however, St. Mary Reservoir (AB011) is located approximately 1.8 km north, and is a globally and nationally significant IBA

for congregatory species. A globally significant population of California gull (*Larus californicus*) have been recorded at the St. Mary’s Reservoir. American white pelicans (*Pelecanus erythrorhynchos*) are sometimes present at the reservoir in nationally significant numbers. Other colonial nesters also nest at the St. Mary Reservoir, including ring-billed gull (*Larus delawarensis*) and double-crested cormorants (*Phalacrocorax auritus*). Non-breeding eared grebes (*Podiceps nigricollis*) and common terns (*Sterna hirundo*) also use the St. Mary’s Reservoir during summer months (Bird Studies Canada 2017, Nature Alberta 2014).

No Environmentally Significant Areas (ESA) are located within the Project area. However, based on the most recent ESA study (Fiera Biological Consulting Ltd. [Fiera] 2014), ESAs are present in properties adjacent to the Project site, including wetlands in the property immediately east, and approximately 1.0 km south of the Project. The ESAs scored high in Criterion 3 (i.e., ecological integrity) based on the Fiera (2014) criteria for ESAs. In addition, sections of the St. Mary Reservoir are also ESAs, scoring high in Criterion 3 and Criterion 4 (i.e., contributing to water quality and quantity), and is nationally significant due to the presence of breeding California gulls, in addition to providing habitat for other waterfowl (Sweetgrass 1997).

3.1.3 SPECIES AT RISK

A desktop review identified 67 species at risk that have the potential to occur within the Project area and surrounding lands (Appendix A, Table 3). A search of the FWMIS database (AEP 2017b) and historical FWMIS records identified four wildlife species at risk documented within the Project area and 1 km buffer (Table 1).

TABLE 1. WILDLIFE SPECIES AT RISK DOCUMENTED WITHIN THE PROJECT AREA AND 1 KM BUFFER

Common Name	Scientific Name	Provincial Designation		Federal Designation	
		Wild Species ¹	Wildlife Act ²	COSEWIC ³	SARA ⁴
Birds					
eastern kingbird	<i>Tyrannus tyrannus</i>	Sensitive	Not Listed	Not Listed	No Status
long-billed curlew	<i>Numenius americanus</i>	Sensitive	Special Concern	Special Concern	Special Concern
prairie falcon	<i>Falco mexicanus</i>	Sensitive	Special Concern	Not at Risk	No Status
Mammals					
pronghorn	<i>Antilocapra americana</i>	Sensitive	Not Listed	Not Listed	No Status

Common Name	Scientific Name	Provincial Designation		Federal Designation	
		Wild Species ¹	Wildlife Act ²	COSEWIC ³	SARA ⁴

- Notes: 1 Status assigned in the 2015 General Status of Alberta Wild Species (AEP 2017a)
 2 *Wildlife Act*, Alberta Queen’s Printer, May 2012.
 3 Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (Government of Canada 2017)
 4 Federal Species at Risk Act (SARA), Schedule 1, Public Registry (Government of Canada 2017)

3.2 FIELD SURVEY RESULTS

Photographs of the sensitive wildlife habitats and features observed within the Project area are depicted in Appendix B.

3.2.1 BREEDING BIRD SURVEYS

Breeding bird surveys were conducted in the early and late spring to ensure all potential bird species that breed at various times throughout the season are observed. In the early spring survey on May 3, 28 birds from 10 different bird species were recorded. During the late spring survey on June 20, 80 birds from 18 different bird species were recorded. Results of the early and late breeding bird surveys are in Appendix C, Table 4 and Table 5.

3.2.2 MIGRATORY BIRD SURVEYS

Spring migratory bird surveys were conducted on April 5, 18, and May 3, 2017 and birds were recorded within a 500 m radius of the survey stations. During the spring migration surveys, 184 birds from 19 different species were recorded; and, the most abundant species observed included the ring-billed gull (*Larus delawarensis*), the house sparrow (*Passer domesticus*), and the European starling (*Sturnus vulgaris*).

Fall migratory bird surveys were conducted on August 31, September 26 and October 23, 2017 and birds were recorded within a 500 m radius of the survey stations. During the fall migration surveys, 666 birds from 17 different species were recorded. The Canada goose (*Branta canadensis*) and Hungarian partridge (*Perdix perdix*) were the most abundant species observed. Results of the spring and fall migratory bird surveys are in Appendix D, Table 6 and Table 7.

3.2.3 SHARP-TAILED GROUSE SURVEY

Sharp-tailed grouse surveys were completed on April 5 and May 3, 2017. No sharp-tailed grouse, signs of grouse or leks were observed.

3.2.4 BURROWING OWL SURVEY

No burrowing owls were heard or seen, and no burrows were observed at any of the four survey stations during the May 18, 2017 callback and the May 18 and 22, 2017 ground surveys.

3.2.5 RAPTOR NEST SURVEY

No raptor nests were observed within the Project area and the 1 km buffer. Nesting habitat was minimal as there were no mature trees within the Project area and very few mature trees observed within the buffer.

3.2.6 AMPHIBIAN SURVEYS

Auditory surveys were not conducted during the amphibian breeding season as there were no areas of standing water and the wetlands were dry. A visual survey was conducted on April 20, 2017 at all three wetlands despite the lack of water. No amphibian species at risk, tadpoles or egg masses were observed.

A visual survey for northern leopard frogs was conducted on August 22, 2017; however, all three wetlands were dry at the time of the survey. No frogs were observed.

Amphibian surveys were not conducted for ephemeral breeders (e.g., plains spadefoot toad and great plains toad) due the lack of water within the wetlands as well as low precipitation during their breeding period between May 1 and June 30, 2017. These toads are selective breeders and will only emerge from hibernation after a short rainfall event (e.g., minimum of 50 mm in 1 to 5 days) otherwise they will skip years of breeding (Alberta Government 2013).

3.2.7 INCIDENTAL WILDLIFE SPECIES

Incidental wildlife species observed during the wildlife and wetland surveys included California gull (*Larus californicus*), Canada goose, an unidentified sparrow species, and tundra swans (*Cygnus columbianus*).

3.2.8 SPECIES AT RISK

Species at risk observed during the breeding and migratory bird surveys included the barn swallow (*Hirundo rustica*), long-billed curlew (*Numenius americanus*) and trumpeter swan (*Cygnus buccinator*).

Barn swallows nest near open areas underneath overhanging structures such as buildings, barns,

culverts and bridges (Federation of Alberta Naturalists 2007), and in caves, holes and ledges in cliff faces (COSEWIC 2011). They are aerial foragers, preying on flying insects in open habitats such as grassy fields, pastures, agricultural crops, wetlands, shorelines and farm yards (COSEWIC 2011).

Long-billed curlews are ground nesters and prefer to nest in extensive, flat areas of native shortgrass prairie or mixedgrass with low cover and little to no shrubs; however, they will utilize some agricultural areas for foraging, breeding, nesting and fledging (COSEWIC 2002, Federation of Alberta Naturalists 2007).

Trumpeter swans prefer wetland and lake habitats that are isolated, small to medium sized, shallow, have stable water levels, well-developed emergent and submergent plant communities where human disturbance is low (Federation of Alberta Naturalists 2007, Alberta Environment and Sustainable Resource Development [AESRD] 2013). In Southern Alberta, the migration wetlands are not used for breeding (AESRD 2013).

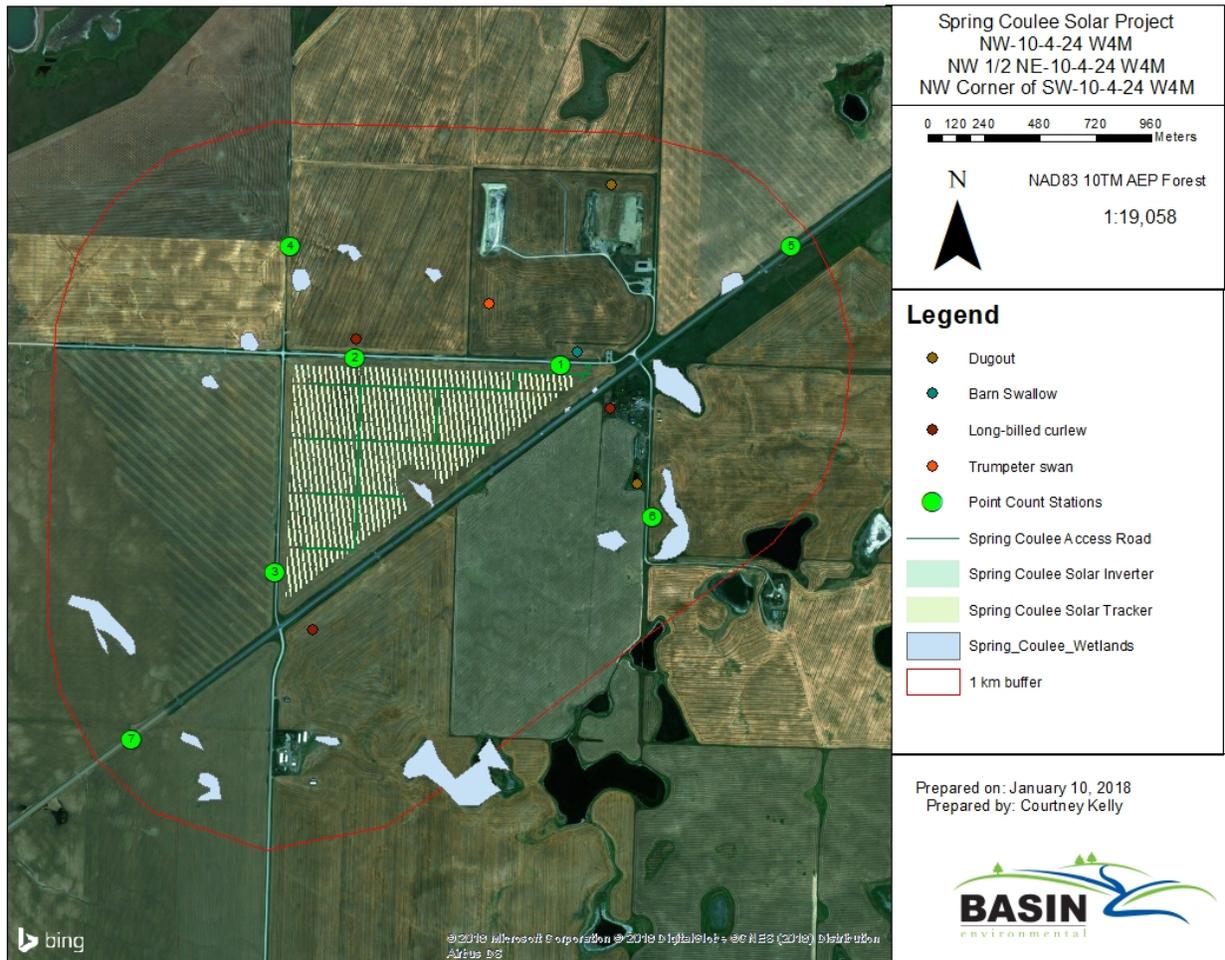


FIGURE 4. LOCATION OF PROJECT INFRASTRUCTURE, OBSERVED SPECIES AT RISK AND WILDLIFE HABITAT FEATURES

4.0 DISCUSSION

4.1 WILDLIFE RESULTS

The wildlife surveys identified the potential occurrence and presence of species at risk and sensitive wildlife habitat within the Project area as well as within the 1 km buffer. The data gathered from these surveys was used to assist with Project planning and to mitigate potential impacts through adjustments to the solar facility siting location (Figure 5, Appendix E).

The availability of wildlife habitat within the Project area is low due to ongoing disturbance from crop cultivation, and a lack of native grassland habitat. Impacts to wildlife habitat will be minimal as biodiversity tends to be lower in agriculturally impacted areas (Government of Canada 2011, Turney and Fthenakis 2011) and the wildlife habitat available within the Project area is mostly temporary. Habitat utilization within the area is primarily for foraging rather than denning or nesting habitat due to a lack of diverse habitat structure and vegetation composition. Therefore, siting the Spring Coulee Solar Project on previously disturbed land minimizes potential impacts to wildlife.

Three wetlands were identified along the southern boundary of the Project area, adjacent to Highway 5; two ephemeral wetlands (Wetlands 1 and 2) and a seasonal wetland (Wetland 3). All three wetlands had water during the spring wetland assessment on May 22, 2017 but were dry during the summer and fall surveys. Although several species of waterfowl and shorebirds were observed on Wetland 3 during the late spring breeding bird survey, this seasonal wetland borders Highway 5, has been heavily disturbed and is devoid of wetland vegetation, organic surface matter and soil horizons. There is also a large wetland within the 1 km buffer, 130 m east of the Project area. During the breeding bird surveys, 6 species of waterfowl and 2 species of shorebird were observed on the wetland. This wetland was larger and held more water than any of the ephemeral wetlands within the project area. This provided suitable habitat for dabbling ducks for feeding, roosting and raising young. However, this wetland is also seasonal and became completely dry during the summer and fall. The shallow and receding water provided habitat for some species of shorebirds.

The wetlands within the Project area lacked suitable habitat for northern leopard frogs due to ongoing disturbances, unavailability of suitable soils and surface water depth. Northern leopard frogs require shallow, warm standing water for breeding (Stevens *et al.* 2010) and deep, aerated wetlands for overwintering; although, they may breed in the same waterbodies as they overwinter (Kristin Cline, pers. comm. [Aug. 9, 2017]). The water was shallow at all the

wetlands therefore minimizing foraging opportunities for amphibians. Soils consisted of organics and clay; not sandy soils which plains spadefoot toads require (Lauzon 1999), therefore the potential presence of these irruptive breeders is low. The wetlands also lack suitable emergent vegetation, water depths for amphibian breeding and overwintering habitat, and suitable sandy soil which is ephemeral breeders require.

Solar Krafte was unable to avoid all 3 wetlands within the Project area; however, upon the recommendation of wetland professionals, none of the solar arrays or inverter pads will be placed in any of the wetlands. The facility fence will avoid Wetland 3 by 1 m on the southeast side, and will be constructed along the ditch line, over top of a culvert that connects Wetland 3 to the east side of Highway 5. Detailed information regarding the wetlands and compensation can be found in the Spring Coulee Solar Project Wetland Assessment and Impact Report (Basin 2017) in Appendix F.

Although Solar Krafte was unable to achieve the 100 m setback required for seasonal wetlands; a 50 m setback will be implemented at Wetland 3. The reduced wetland setback is not expected to increase the risk to wildlife as Solar Krafte is committed to implementing all the mitigation measures outlined in Section 5.0 including, but not limited to: silt fencing will be installed around the wetland at the 50 m setback to construction as a preventative measure; pre-construction amphibian surveys will continue to identify any amphibians on site that need to be mitigated for; an experienced wildlife biologist will also be present on-site during construction; and, as a last resort, amphibians found on the construction site will be relocated. Relocation will require a permit and methodologies will be approved by AEP in advance.

The risk will remain low as wildlife use within the area is primarily foraging rather than denning or nesting due to a lack of water depth, suitable substrate, diverse habitat structure, emergent vegetation and vegetation composition, as well as the existence of suitable wetland habitat in surrounding land. Birds that use the wetlands will have adapted to ongoing disturbances from irrigation sprinklers tracking through the wetlands, and crop seeding/cultivation. These disturbances impact nesting habitat suitability and disturb breeding birds.

Species at risk observed during the wildlife surveys included: trumpeter swan, barn swallow, and long-billed curlew. Habitat loss for all three of these species at risk will be low during Project construction due to a lack of native prairie habitat and nesting habitat/structures, and the availability of suitable foraging, breeding and migratory habitat outside of the Project area. There was no foraging, nesting or migratory habitat available for trumpeter swans within the Project area. Nesting habitat for breeding birds was poor within the Project area due to ongoing disturbances from irrigation and crop seeding/cultivation. The lack of habitat structure and the

seasonal nature of the cover limits the agricultural cropland to an area that is likely used as an occasional stop-over for migrating birds and wildlife for rest and forage.

Habitat loss due to Project activities for the other species at risk that have previously been documented within the Project area and 1 km buffer will also be low due to a lack of native grassland vegetation, suitable breeding habitat, and foraging opportunities. In addition, more suitable habitat exists outside of the Project area. No raptor nesting habitat was available within the Project area; however, there were small clumps of deciduous trees within the 1 km buffer. A red-tailed hawk and several unidentifiable raptor species were observed circling above adjacent fields during the fall migratory surveys. Mitigation measures to prevent and minimize impacts to species at risk and other wildlife are presented in Section 5.0.

There is the potential for noise disturbance and human presence during clearing and construction and site maintenance that may temporarily displace wildlife, however, these species will likely find suitable habitat elsewhere. Also, these impacts will be minimized through the implementation of mitigation measures such as nest sweeps prior to clearing and construction, and having an experienced environmental professional onsite during construction to ensure compliance with the appropriate environmental laws and regulations.

During the operation of the solar PV facility, wildlife may benefit from management of the vegetation growing beneath and around the panels if it is mowed, mulched or sprayed and maintained without chemicals, fertilizers and pesticides (RSPB 2014). A cover crop will be planted and used for dust control, and maintained through mowing. Solar Krafte will also consult with local farmers to develop site appropriate noxious and prohibited noxious weed and agricultural pest control methods.

Solar Krafte is working with Alberta honey producers and a professional agrologist to evaluate plant species such as alfalfa, borage, milkvetch and sainfoin as a future cover crop under and around the solar arrays for honey production. To ensure the integrity of the wetlands, the future cover crop will not be planted within 50 m of the wetland. These species are being considered due to their stunted growth and minimal maintenance requirements, once established.

4.2 POTENTIAL IMPACTS DURING CONSTRUCTION AND OPERATION

Environmental assessments of solar PV facilities in the United States, Europe and Africa have shed light on potential wildlife impacts resulting from siting, construction and operation of these facilities. Solar energy is relatively new to Alberta; therefore, the information discussed in this section has been compiled from literature reviews of solar PV facility projects.

Potential impacts to wildlife from solar energy development include habitat loss and fragmentation, loss of connectivity, alteration and degradation, and water use (Turney and Fthenakis 2011; RSPB 2014; Bird Life International 2017). Other reports have identified wildlife displacement and mortality as additional impacts from solar PV facility developments (Turney and Fthenakis 2011; RSPB 2014; Bird Life International 2017). Proper siting of the facility may reduce wildlife impacts (Northrup and Wittemyer 2013).

4.2.1 HABITAT LOSS AND FRAGMENTATION

Habitat loss and fragmentation can be the largest contributor to impacts resulting from the siting of the solar PV facility (Bird International 2017) and is an unavoidable result of project developments. Although species at risk require large amounts of connecting habitat and are more susceptible to edge effects and habitat alteration (Fahrig 2003, AEP 2016b), the native grassland habitats within the Project area have been permanently converted to agricultural use, therefore minimizing the impact of habitat loss resulting from the placement of the solar facility.

For public safety and to discourage unauthorized entry to the site, the fence that surrounds the facility will be a 6 foot chain-link fence with a single strand of barbed wire on the top. The single barbwire strand will be flagged with hi-visibility tape to increase visibility for wildlife. The bottom of the chain-link fence around the entire facility will be raised by 6 inches to allow for ease of wildlife passage into and out of the facility. All of the fencing will be squared off and constructed straight to ensure there are no wildlife entrapment issues.

Although the chain-link fencing may exclude some large mammals such as pronghorn, it will not restrict all wildlife movements. Wildlife such as small mammals, ground nesting birds, amphibians and reptiles should still be able to access the wetland habitat as well as the vegetation growing beneath and around the solar arrays by going through and over the fence.

4.2.2 HABITAT DEGRADATION

Construction and operation of the Project may result in area avoidance by wildlife due to human presence, and noise impacts during construction activities; however, wildlife species that frequent the Project area are likely habitat generalists and may find more suitable habitat nearby. In addition, these wildlife species may be acclimatized to seasonal disturbances from cultivation and farming activities. Impacts to wildlife from noise during the operation of the facility may be minimal as there is no significant noise attributed to the tracker movement and PV solar systems are known to generate electricity without generating noise (Tsoutsos *et. al.* 2005). The

manufacturer, SunGrow reported the inverters have a sound level of <70 dBA following the ISO 3746 standard.

4.2.3 MORTALITY RISK

Although there is a risk of wildlife mortality associated with the operation of the solar PV facility; there is no risk of electrocution of birds as all lines and cables will be buried underground during construction of the Spring Coulee Solar Project. The risk of wildlife mortality is associated with the incidental wildlife deaths due to the risk of collision with the surface of the panels should they resemble waterbodies (Jenkins *et al.* 2015) and collisions with maintenance vehicles and equipment. Although the risk of collision along the access roads may be lower than the risk to wildlife along Highway 5, Range Road 243 and Township Road 42, which borders the Project area.

The reflection of polarized light from the solar arrays may impact avian foraging behavior, navigation and orientation (US Fish and Wildlife Service 2015), as well as aquatic insects and insectivorous predators (e.g., bats) which may result in direct mortality from collision trauma (Horvath *et.al.* 2009, RSPB 2014, Jenkins *et al.* 2015, Harrison *et. al.* 2016). Other contributors that may influence direct mortality impacts from the solar PV facility may be the siting location and its proximity to bird habitats (e.g., wetlands, migration routes) (Northrup and Wittemyer 2013), geographic setting for bird migration patterns, seasonal differences in species abundance, weather, and daytime vs. nighttime (Walston *et.al.* 2015).

Avian wildlife are at a higher risk of mortality due to collisions and stranding as a result of the “lake effect” hypothesis, which occurs when water birds mistake the large arrays of PV panels as open bodies of water or wetlands (Horvath *et.al.* 2009, Jenkins *et al.* 2015). Diving bird species such as grebes, mergansers and loons are at risk of collisions and stranding on the solar arrays as they require water to take flight (Walston *et.al.* 2015). This impact may be minimal for the Spring Coulee Solar Project as there is no permanent wetland habitat within the Project area and other, more important breeding, nesting and migratory habitats are located nearby. It should be noted, however, that the “lake effect” hypothesis has not been supported or disproven to date due to the limited number of solar projects reviewed and to inconsistencies of mortality observations by species groups (Walston *et.al.* 2015). There is also a potential risk of collisions with the panels from ground nesting bird species (Harrison *et. al.* 2016) as birds may nest underneath the panels once ground cover has been established. Maintenance of the ground cover outside of the breeding bird season will minimize impacts to ground nesting species.

Carcasses collected at solar energy sites in the United States have included a wide array of taxa including ducks, raptors, rails, shorebirds, and songbirds that have died from collisions with infrastructure and the ground (Kagan *et al.* 2016; Smith and Dyer 2016). To reduce fatalities, RSPB (2014) and Bird Life International (2017) recommends siting the solar PV facility away from water (e.g., wetlands, lakes), and placing white grid partitioning on the solar panels to help reduce or eliminate the polarized light and to deter birds and insects (Horvath *et. al.* 2010).

5.0 CONSTRUCTION AND OPERATION MITIGATION PLAN

Solar Krafte is committed to the implementation of the mitigation measures, standards and best management practices outlined in Table 2, which will help to minimize the potential impacts identified in Section 4. Regulatory requirements and mitigation measures will be reviewed during pre-job meetings to ensure that all mitigation requirements are understood and can be implemented.

Avoidance is the primary strategy for preventing negative impacts on wildlife. The Project area is currently used for agricultural crop cultivation and livestock grazing, so native grassland habitat will not be impacted by construction and operation activities. The absence of native grassland habitat within the Project area reduces the risk of conflict with nesting birds and other wildlife.

5.1 MITIGATION MEASURES

Minimizing impacts during construction activities will involve good working practices, site restoration and avoidance of sensitive habitats (Tsoutsos *et. al.* 2005). The mitigation measures, outlined in Table 2 are included to minimize and/or eliminate potential impacts to wildlife, species at risk and sensitive habitats.

Sediment and erosion control, and waste water management mitigation measures will be implemented throughout construction to minimize impacts to wildlife and wildlife habitat in and around the Project area.

To further reduce the risk of adverse effects to breeding birds, Solar Krafte will make every attempt to schedule construction outside of the grassland breeding bird season (April 1 to July 15). However, if construction does occur within the breeding bird season, pre-construction nest surveys will be conducted by an experienced wildlife biologist. A species-specific setback buffer will be established around any active nests, burrows and dens that are identified, and no construction activity will be permitted within the setback until the wildlife feature is determined to be inactive. Species appropriate setbacks are identified in Appendix C of the Wildlife Directive for Alberta Solar Energy Projects (AEP 2017b). For all species that are not listed in the Directive, a 100 m setback will be the standard, unless otherwise discussed and agreed to by an AEP Wildlife Biologist.

During operation, maintenance of ground cover will not occur during the breeding bird season due to the presence of ground nesting bird species. PV panels will be installed at a sufficient

height so that mowing is not needed during the breeding bird season. Any wildlife mortalities discovered during construction will be investigated and documented. Mitigation will be implemented to prevent future mortalities.

TABLE 2. RECOMMENDED MITIGATION MEASURES FOR THE CONSTRUCTION AND OPERATION PHASES OF THE SPRING COULEE SOLAR PROJECT

Concern	Construction Mitigation	Operation Mitigation
<p>General</p>	<ul style="list-style-type: none"> • Project personnel will be provided with an environmental orientation, including site-specific environmental sensitivities and mitigation measures (e.g., spill response plan). • Project personnel will be provided environmental training as part of the site orientation. • Project personnel will report wildlife injuries/mortalities to the onsite experienced wildlife biologist. Responses will be case-specific, in consultation with the local Fish and Wildlife office. If handling or transportation to a wildlife rehabilitation center is required, all handling of wildlife will be conducted by an experienced wildlife biologist, in consultation with AEP. • Snake awareness and safety training will be provided to all on-site workers. If snakes are regularly found on-site (regardless of species), Solar Krafte will contact AEP to determine if a snake mitigation plan is needed for the protection of the snakes as well as the safety of their workers. 	<ul style="list-style-type: none"> • Project personnel will be provided with an environmental orientation, including site-specific environmental sensitivities and mitigation measures (e.g., wildlife mortality reporting). • Project personnel will be provided environmental training as part of the site orientation. • Project personnel will report wildlife injuries/mortalities to experienced wildlife biologist. Responses will be case-specific, in consultation with the local Fish and Wildlife office. If handling or transportation to a wildlife rehabilitation center is required, all handling of wildlife will be conducted by an experienced wildlife biologist, in consultation with AEP. • Snake awareness and safety training will be provided to all on-site workers. If snakes are regularly found on-site (regardless of species), Solar Krafte will contact AEP to determine if a snake mitigation plan is needed for the protection of the snakes as well as the safety of their workers.

Concern	Construction Mitigation	Operation Mitigation
<p>Timing Restrictions</p>	<ul style="list-style-type: none"> • In compliance with the federal <i>Migratory Birds Convention Act</i> and the Alberta <i>Wildlife Act</i>, construction will be conducted outside of the breeding bird season from April 1 to July 15 (AEP 2017b), where possible. • Amphibian surveys will be required within 100 m of wetlands during the breeding season to determine the presence of breeding habitat for amphibians. If breeding amphibians are found, silt fencing to a minimum height of 30 cm will be placed around the wetlands at the setback distance prior to construction to minimize potential impacts to amphibians. 	<ul style="list-style-type: none"> • In compliance with the federal <i>Migratory Birds Convention Act</i> and the Alberta <i>Wildlife Act</i>, vegetation maintenance will be avoided during the breeding bird season April 1 to July 15 (AEP 2017b).
<p>Nest Protection</p>	<ul style="list-style-type: none"> • If work must be conducted during the breeding bird season, a nest sweep will be required 7 days prior to work commencement and is valid for 7 days. Additional sweeps will be required after 7 days to prevent contravention of the <i>Migratory Birds Convention Act</i>. • Should an active nest be found, a species appropriate setback buffer and timing restriction will be established by an experienced wildlife biologist, and the Contractor will be notified. • Active nests, dens or burrows of prescribed species will not be disturbed. 	<ul style="list-style-type: none"> • If work must be conducted during the breeding bird season, a nest sweep will be required 7 days prior to work commencement and valid for 7 days. Additional sweeps will be required after 7 days to prevent contravention of the <i>Migratory Birds Convention Act</i>. • Should an active nest be found, a species appropriate setback buffer and timing restriction will be established by an experienced wildlife biologist, and the Contractor will be notified. • Active nests, dens or burrows of prescribed species will not be disturbed.

Concern	Construction Mitigation	Operation Mitigation
Noise Abatement (management)	<ul style="list-style-type: none"> • If construction is required during the breeding bird season, noise levels will be monitored to ensure they do not exceed an average of 10 dB above natural ambient levels, or 50 dB (ECCC 2017b). • All equipment will be equipped with functioning mufflers or other appropriate sound dampening devices. • Construction activities will be restricted to daytime hours if possible, to avoid noise disruption at night. 	<ul style="list-style-type: none"> • All equipment will be equipped with functioning mufflers or other appropriate sound dampening devices.
Vehicle collisions	<ul style="list-style-type: none"> • A 30 km/hour speed limit will be in effect on all access roads within the Project area. Any wildlife mortalities will be reported to AEP. • Vehicle activity in sensitive areas will be minimized. 	<ul style="list-style-type: none"> • A 30 km/hour speed limit will be in effect on all access roads within the Project area. Any wildlife mortalities will be reported to AEP. • Vehicle activity in sensitive areas will be minimized.
Wetland protection	<ul style="list-style-type: none"> • An experienced wildlife biologist will be on-site during construction activities to provide instruction to the contracting crew to ensure regulatory compliance for working in/around waterbodies, including wetlands. • Clearing or disturbance to vegetation near wetlands will be avoided. • Silt fence will be properly installed around all retained wetlands at the setback distance, within and immediately adjacent to the Project footprint. 	<ul style="list-style-type: none"> • A site-specific Erosion and Sediment Control Plan will be developed and implemented to minimize erosion and prevent sedimentation within waterbodies during all phases of the project. • Non-biodegradable erosion and sediment control materials will be removed once the site is stabilized. • Fuel and oil products will not be stored within 100 m of any wetland or waterbody. • Maintenance or refueling of vehicles and equipment will be

Concern	Construction Mitigation	Operation Mitigation
	<ul style="list-style-type: none"> • If weather and ground conditions deteriorate while working within 100 m of the wetlands/ waterbodies (outside of the established setbacks), access matting or low ground pressure (LGP) equipment will be used to avoid heavy rutting or ground compaction. • Construction will be stopped if amphibians emerge to breed during construction; and will resume at the discretion of the onsite experienced wildlife biologist in conjunction with approval from AEP. • A site-specific Erosion and Sediment Control Plan will be developed and implemented to minimize erosion and prevent sedimentation within waterbodies during all phases of the project. • Erosion and sediment control measures and structures will be regularly inspected and maintained during the construction activities. • Construction activities will be halted during adverse construction conditions caused by heavy rains or other weather events. • Non-biodegradable erosion and sediment control materials will be removed once the site is stabilized. 	<p>conducted a minimum of 100 m away from the wetlands and irrigation canals, and spill trays will be used.</p> <ul style="list-style-type: none"> • Emergency spill kits will be maintained on site and readily accessible.

Concern	Construction Mitigation	Operation Mitigation
	<ul style="list-style-type: none"> Fuel and oil products will not be stored within 100 m of any wetland or waterbody. Maintenance or refueling of vehicles and equipment will be conducted a minimum of 100 m away from the wetlands and irrigation canals, and spill trays will be used. Emergency spill kits will be maintained on site and readily accessible. 	
Wildlife movement	<ul style="list-style-type: none"> Amphibian surveys will be conducted prior to any ground disturbance to mitigate potential wildlife disturbances. An experienced wildlife biologist will be on site to monitor the construction area and relocate any amphibians (upon AEP approval) that are found within the construction area, to reduce injury or mortality risk. Fences will be squared off and constructed straight to avoid entrapment and restrict wildlife movement. 	<ul style="list-style-type: none"> Fences will be squared off and constructed straight to avoid entrapping and restricting wildlife movement.
Stranded and injured wildlife	<ul style="list-style-type: none"> Appropriate Provincial and Federal wildlife permits/authorizations will be obtained before handling dead or injured wildlife, or conducting wildlife surveys. Construction personnel will be prohibited from feeding, harassing and hunting wildlife. Trenches that must be left overnight will be covered or 	<ul style="list-style-type: none"> Appropriate Provincial and Federal wildlife permits/authorizations will be obtained before handling dead or injured wildlife, or conducting wildlife surveys. Electrical collection/transmission lines will be buried.

Concern	Construction Mitigation	Operation Mitigation
	<p>sloped so that wildlife does not become trapped within the excavation.</p> <ul style="list-style-type: none"> • Electrical collection/transmission lines will be buried. 	
Light pollution	<ul style="list-style-type: none"> • Construction activities will occur during daylight hours, starting half an hour after sunrise and ending half an hour before sunset. • Required lighting will be selected and positioned to minimize spill light, upward light and glare. • When possible, lights equipped with motion sensors will be used to minimize the time they are on. 	<ul style="list-style-type: none"> • Required lighting will be selected and positioned to minimize spill light, upward light and glare. • When possible, lights equipped with motion sensors will be used to minimize the time they are on.
Vegetation Maintenance	<ul style="list-style-type: none"> • Vegetation clearing will occur outside of the breeding bird window; if clearing is required within it, nest sweeps will be completed a minimum of 7 days prior to any disturbance. • The use of fertilizers, herbicides and pesticides will be avoided. • Native grassland seed mixtures will be used to revegetate any disturbed natural areas. • Vegetation disturbance will be minimized using methods such as access matting, reduced stripping and winter construction. 	<ul style="list-style-type: none"> • Vegetation clearing will occur outside of the breeding bird window; if clearing is required within it, nest sweeps will be completed a minimum of 7 days prior to any disturbance. • The use of fertilizers, herbicides and pesticides will be avoided. • Alternative vegetation maintenance methods, such as grazing by sheep or goats, will be considered.
Invasive, Noxious and Prohibited Weeds	<ul style="list-style-type: none"> • All vehicles and equipment will be cleaned prior to accessing Project work sites to minimize the introduction of invasive species. 	<ul style="list-style-type: none"> • All vehicles and equipment will be cleaned prior to accessing Project work sites to minimize the introduction of invasive species.

Concern	Construction Mitigation	Operation Mitigation
	<ul style="list-style-type: none"> • Noxious and prohibited noxious weeds will be controlled in accordance with the Alberta <i>Weed Control Act</i> (Government of Alberta 2011). • Certified weed-free seed mixes will be used during reclamation. • When possible, interim reclamation will be completed to prevent weed species from establishing. 	<ul style="list-style-type: none"> • Noxious and prohibited noxious weeds will be controlled in accordance with the Alberta <i>Weed Control Act</i> (Government of Alberta 2011).

6.0 POST-CONSTRUCTION MONITORING AND MITIGATION PLAN

6.1 PURPOSE AND TIMING

The purpose of post-construction monitoring is to determine the effectiveness of the protection and mitigation measures outlined in the Operations Mitigation Plan (Section 5.0) and identify any ongoing impacts or risks to wildlife. Monitoring will determine whether additional or modified mitigation measures are required.

Post-construction monitoring wildlife surveys are required annually, for a minimum of three years, after the Spring Coulee Solar Project is operational. Post-construction monitoring surveys will consist of:

- documenting wildlife mortality within specific the solar arrays;
- determining carcass removal by scavengers or other means;
- determining searcher efficiency in detecting wildlife carcasses; and,
- monitoring impacts of the solar energy project on species at risk, sensitive species or other wildlife.

In addition to post-construction monitoring surveys, breeding bird surveys will also be conducted to compare pre- and post-construction results.

6.2 METHODS

Post-construction monitoring will be conducted annually by two experienced wildlife biologists or experienced professionals between March 1 and November 15 during the spring and fall migration, and the summer breeding season. Weekly surveys will be conducted during the migratory periods from March 1 to May 15, and from August 15 to November 15. During the summer breeding season, surveys will be conducted bi-weekly from May 16 to August 14.

Carcasses detected during the mortality searches will be recorded, and carcass persistence rates and searcher efficiency rates (see below) will be used to produce an estimated mortality rate for the Project area. Searcher efficiency and carcass persistence estimates will account for changes between seasons and will be done in the analysis of the post-construction monitoring results. The observed and estimated mortality rates will be provided to AEP in an annual post-construction monitoring report.

A Wildlife Research Permit and Collection License will be obtained from AEP prior to conducting the post-construction monitoring surveys.

6.2.1 MORTALITY SEARCHES

Mortality searches will be conducted to determine the number of dead, injured and stranded wildlife found within the Project area. Stranded and injured wildlife will be included in the mortality count. If stranded and/or injured wildlife are found, the monitors will contact the AEP Fish and Wildlife Office in Brooks (403-362-1232) for specific advice or contact the Alberta Wildlife Rehabilitators Association (403-946-2361). All carcasses of species at risk and sensitive species will be collected, identified, labeled, frozen and submitted to AEP.

Sampling areas will be randomly distributed throughout one third of the entire footprint (26.67 ha) which equates to approximately 0.27 square kilometers (km²). A stratified random sampling method will be used to ensure that the Project area is accurately represented within the sample. The sampling area will be selected to be representative of that of the Project area (e.g., landscape, vegetation, project infrastructure). If the Project area is homogeneous, no stratification will be required. To adjust for imperfect detection, carcass detection and removal trials will be conducted to help calculate the estimated mortality rate. Narrow transects (e.g., 10 m wide) will be used within the sampling areas to increase the detection rate/searcher efficiency. The transects will be walked at a slow pace, consistent with walking speeds used during the carcass detection trials. Exact speeds will be determined in the field, as they are dependent on the amount of cover within the search areas.

Mortality estimates will be corrected using the following formula (Ontario Ministry of Natural Resources [OMNR] 2011):

$$C = c / (S_{e0} \times S_c \times P_s)$$

C is the corrected number of bird fatalities

c is the number of carcasses found

S_{e0} is the weighted proportion of carcasses expected to be found by searchers (searcher efficiency)

S_c is the proportion of carcasses not removed by scavengers over the search period (persistence rate)

P_s is the proportion of the area searched

6.2.2 CARCASS REMOVAL TRIALS

Carcass removal trials will be conducted to determine the duration of time that a carcass is expected to persist in the Project area before decomposing or being removed by a scavenger. This persistence rate can be influenced by location, carcass size, and season.

Fresh carcasses (i.e., frozen within 24 hours of death) will be used, and will be thawed prior to placement. If fresh carcasses are unavailable, Solar Krafte will use mortalities from window collisions as surrogate carcasses and/or inquire with Fish and Wildlife to see if they could donate any large bird carcasses, as this size class is unlikely to strike windows. If available, carcasses found during mortality searches will be also be used. Carcasses of varying size categories, small (i.e., chickadees, warblers, sparrows, finches), medium (i.e., woodpeckers, grosbeaks, thrush) and large (i.e., waterfowl, raptor, pigeon) will be placed around the Project area to mimic collision mortalities. The trial carcasses will be marked to distinguish from other mortalities, and their locations (UTM coordinates) will be recorded. A suitable method to be used for marking will be determined in consultation with AEP. A minimum of five carcasses will be used in each trial, preferably two from each size class, dependent on availability (e.g., number of carcasses from each size class, not the availability of carcasses). A minimum of two carcass removal trials will be conducted each season (e.g., spring, summer, fall).

The trial carcasses will be placed on site for four weeks, or until they disappear. They will be inspected daily for the first four days, followed by increasing intervals between inspections. An example schedule would include inspection on days 1, 2, 3, 4, 7, 10, 14, 21, and 28.

6.2.3 WILDLIFE CARCASS DETECTION

Carcass detection trials will be conducted to determine searcher efficiency at locating carcasses within the Project area. Similar to persistence rates, searcher efficiency rates can be influenced by location (e.g., habitat/cover type), carcass size, season (height of vegetation), and searcher experience. A minimum of twenty carcasses of various sizes will be used in each trial, randomly placed throughout the search area. Locations (UTM coordinates) of the trial carcasses will be recorded, as well as ground cover height; and, the carcasses will be collected after the trial for use in the carcass removal trials. Detection trials will be conducted once per season (e.g., spring, summer, fall) for each biologist who will be assisting with the mortality searches.

6.2.4 WILDLIFE IMPACT MONITORING

All notable wildlife observations made during the mortality searches, carcass removal trials, and carcass detection trials will be recorded. For bird mortalities, the following information will be collected:

- Species (if possible);
- Age and sex (if possible);
- Condition of carcass (e.g., injuries, state of decomposition, estimated time of death);
- Location (UTM coordinates);
- Proximity to Project structures and/or habitat features;
- Date and time of discovery;
- Weather conditions; and,
- Photos of the carcass and surrounding area.

In addition to mortality data, any observed changes in wildlife behavior, changes in species composition, or potential threats to wildlife will be documented and reported.

If any sensitive species or species at risk mortalities are found, the carcasses will be labeled, frozen, and submitted to AEP. No carcasses of sensitive species or species at risk will be used for the carcass removal or detection trials. If a high rate of bird mortality is observed during monitoring, AEP will be contacted to discuss additional mitigation options. High mortality rates to be determined by AEP.

6.3 POST-CONSTRUCTION MITIGATION PLAN

As part of an adaptive management approach, mitigation measures will be adjusted if an unacceptably high level of wildlife mortality is observed during the post-construction monitoring period. Ineffective mitigation measures will be redesigned and implemented, in consultation with AEP. Potential mitigation measures could include the installation of bird deterrents, addition of white gridlines to the solar panels, or increased spacing between the solar arrays. If necessary, cameras can be set up to help investigate the mortalities.

If post-construction mitigation measures are required, Solar Krafte will conduct a further 2 years of post-construction monitoring to assess their success and ensure the mitigation measures used are effective. If the mitigation is unsuccessful, then further mitigation measures and post-construction monitoring will be required as prescribed by the AEP Wildlife Biologist (AEP 2017c). Solar Krafte will allow access to the Project area and ensure that private landowners are

aware of and consent to visits to the site by AEP Wildlife Biologist(s) or associated researcher(s) upon receipt of a written request.

Solar Krafte has committed to keeping the wildlife surveys (i.e., raptor nest searches, burrowing owl, and sharp-tailed grouse surveys) current, as outlined in Standard 100.2.4 of the Directive, until the commissioning of the Project. If the Project has not started construction by 2022 (i.e., 5 years), all of the wildlife surveys will be repeated, and a new referral report may be required. Mitigation measures will be implemented for all new wildlife features, in agreement with the AEP Wildlife Biologist.

6.4 REPORTING REQUIREMENTS

A post-construction monitoring report will be submitted annually to AEP, date to be determined once Project construction is complete, in consultation with the AEP Regional Wildlife Biologist. The report will include the following:

- A detailed description of the survey methods;
- the raw data, using the appropriate FWMIS datasheet for each solar collector/reflector;
- results of searcher efficiency trials and scavenger removal trials;
- the uncorrected fatality rate for birds and other wildlife expressed as the number of mortalities per megawatts per year;
- the corrected rates of mortalities/megawatts/year as per Huso (2011) or acceptable alternative;
- a summary of species killed and the condition of their carcasses;
- results of pre-construction wildlife surveys;
- a comparison of pre- and post-construction survey results if required as per Standard 100.4.3d; and,
- a statement of compliance with the Directive and the signature of the lead biologist.

7.0 CONCLUSIONS

The Spring Coulee Solar Project was sited on previously disturbed land to avoid native grassland habitat and minimize potential impacts to species at risk. The land within the proposed Project footprint was cultivated and is bordered by Highway 5, Township Road 42 and Range Road 243.

Three wetlands were present within the Project area, two ephemeral wetlands (Wetland 1 and 2) and a seasonal wetland (Wetland 3); however, the was highly disturbed from cultivation which had resulted in the removal of all the emergent vegetation and had stripped the organic matter and soil horizons. Solar Krafte was unable to avoid all 3 wetlands, however, arrays will not be placed within 50 m of Wetland 3. Although Solar Krafte was unable to achieve the 100 m setback required for Wetland 3 to be minimally impacted by fencing; the reduced setback is not expected to increase the risk to wildlife.

The risk to wildlife as a result of the reduced setback will remain low as the Project area is primarily used for foraging rather than denning or nesting habitat, and the wetlands lack suitable water depth, suitable substrate, diverse habitat structure, emergent vegetation and vegetation composition. In addition, suitable wetland habitat is available in the surrounding land. Amphibian habitat was minimal for the northern leopard frogs and plains spadefoot toads due to ongoing disturbances, and a lack of suitable soils, emergent vegetation and surface water depth.

Three species at risk were observed during the wildlife surveys: trumpeter swan, barn swallow, and long-billed curlew. Habitat utilization within the Project area is low due to the lack of native prairie habitat, suitable wetland habitat for breeding and overwintering, diverse habitat structure and vegetation composition, as well as the existence of suitable habitat in surrounding land. Therefore, habitat loss for the observed species as well as those that have been previously documented within the 1 km buffer will be low as a result. Although the Project area is currently used for foraging by breeding and migrating birds, the unavailability of permanent habitat structures like mature trees, and the presence of wetland disturbances and ongoing agricultural practices limit the availability of nesting and breeding habitat for species at risk and other wildlife.

As wildlife utilize the Project area for foraging, there is the potential for noise disturbance and human presence during clearing, construction and site maintenance. This may cause some wildlife displacement; however, these species will likely find suitable habitat elsewhere. Also, these impacts will be minimized through the implementation of mitigation measures such as nest sweeps conducted 7 days prior to clearing, construction and maintenance by a experienced wildlife biologist. To ensure the risk to wildlife is low during construction and operation, the

mitigation measures outlined in Section 5 will be in place to eliminate and/or minimize potential impacts. An experienced wildlife biologist will be on site to monitor construction of the Spring Coulee Solar Project to ensure that the mitigation measures are in place and are being followed, to ensure the safe relocation of any potential wildlife (with AEP's approval) that may be encountered during construction, and to ensure that all of the applicable environmental laws and regulations are being followed.

To determine the effectiveness of the mitigation measures, wildlife biologists will conduct post-construction monitoring of the facility for a minimum of 3 years once the facility is operational, to identify any ongoing impacts or risks to wildlife. Wildlife surveys will be conducted on an annual basis to document wildlife mortality, determine carcass removal and searcher efficiency and to monitor potential impacts that the Spring Coulee Solar Project may have on species at risk, sensitive species and other wildlife.

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9.0 APPENDICES

APPENDIX A

SPECIES AT RISK WITH POTENTIAL TO OCCUR WITHIN PROJECT AREA

TABLE 3. SPECIES AT RISK WITH POTENTIAL TO OCCUR WITHIN THE PROJECT AREA

Common Name	Scientific Name	Conservation Status	Habitat Requirements
Amphibians			
northern leopard frog	<i>Lithobates pipiens</i>	At Risk ¹ , Special Concern ^{2,3} , Threatened ⁴	springs, moist upland meadows, riparian areas, ponds, permanent waterbodies; clear, clean water
plains spadefoot	<i>Spea bombifrons</i>	May be at Risk ¹ , Not at Risk ²	short grass prairie, sandy soil
western tiger salamander	<i>Ambystoma mavortium</i>	Special Concern ²	small bodies of water, lakes; logs, debris, burrows
Birds			
alder flycatcher	<i>Empidonax alnorum</i>	Sensitive ¹	willows, alders, brushy swamps, swales; thickets of deciduous trees and shrubs near ponds, streams and bogs
American bittern	<i>Botaurus lentiginosus</i>	Sensitive ¹	Emergent wetlands; tall, dense grasses and bulrush
American kestrel	<i>Falco sparverius</i>	Sensitive ¹	open to semi-open habitats; cities, forest edges, farmland, grassland; raised perches
American white pelican	<i>Pelecanus erythrorhynchos</i>	Sensitive ¹ , Not at Risk ²	large shallow lake, rivers and marshes; isolated, low-lying islands
Baird's sparrow	<i>Ammodramus bairdii</i>	Sensitive ¹ , Special Concern ^{2,3}	Native prairie, tall grass, tall weeds, low bushes, wheat fields, lightly grazed pastures
bald eagle	<i>Haliaeetus leucocephalus</i>	Sensitive ¹ , Not at Risk ²	Near large rivers, lakes; mountains, open country, dry areas near water
Baltimore oriole	<i>Icterus galbula</i>	Sensitive ¹	open woodland, forest edge, orchards, riparian forests, parks, backyards
bank swallow	<i>Riparia riparia</i>	Sensitive ¹ , Threatened ²	near water, fields, marshes, streams, lakeshores, open areas; steep banks of dirt and sand

Common Name	Scientific Name	Conservation Status	Habitat Requirements
barn swallow	<i>Hirundo rustica</i>	Sensitive ¹ , Threatened ²	Open, semi-open areas, farms, fields, marshes, lakes; buildings, bridges, cliffs near farms and cities
black-necked stilt	<i>Himantopus mexicanus</i>	Sensitive ¹	Grassy marshes, mudflats, pools, shallow lakes (fresh and alkaline), edges of exposed mudflats; margins of shallow water in very open country, especially where there is lots of marsh growth
black-crowned night heron	<i>Nycticorax nycticorax</i>	Sensitive ¹	shallow cattail and bulrush marshes, small lakes, slow rivers
black tern	<i>Chlidonias niger</i>	Sensitive ¹ , Not at Risk ²	Marshes, sloughs, rivers, lakeshores, wet meadows, typically in sites with mixture of emergent vegetation and open water
bobolink	<i>Dolichonyx oryzivorus</i>	Sensitive ¹ , Threatened ²	hayfields, meadows, marshes, natural prairies with dense grass, weeds and low bushes
burrowing owl	<i>Athene cunicularia</i>	At Risk ¹ , Threatened ^{2,3} , Endangered ⁴	open grasslands, prairie, farm fields, airstrips; flat, open ground with very short grass and bare soil
Caspian tern	<i>Hydroprogne caspia</i>	Sensitive ¹	shorelines of wetlands, lakes and river; islands in lakes and rivers
chestnut-collared longspur	<i>Calcarius ornatus</i>	At Risk ¹ , Threatened ^{2,3}	short grass prairies with longer grass and taller weeds, fields, plains
common nighthawk	<i>Chordeiles minor</i>	Sensitive ¹ , Threatened ^{2,3}	Dry coniferous forests, open cottonwood forests, meadows, larger lakes and grasslands.

Common Name	Scientific Name	Conservation Status	Habitat Requirements
common yellowthroat	<i>Geothlypis trichas</i>	Sensitive ¹	Marshes (especially cattail), thickets near water, bogs and brushy pasture.
eastern kingbird	<i>Tyrannus tyrannus</i>	Sensitive ¹	open areas with willow and birch shrubs, agricultural areas, riparian areas
eastern phoebe	<i>Sayornis phoebe</i>	Sensitive ¹	wooded areas near water, human-built structures, bare rock outcrops
ferruginous hawk	<i>Buteo regalis</i>	At Risk ¹ , Threatened ^{2,3} , Endangered ⁴	prairies, dry grassland, sagebrush plains, rangeland, desert, plowed fields
Forster's tern	<i>Sterna forsteri</i>	Sensitive ¹	Cattail marshes, backwaters, large marshy lakes
golden eagle	<i>Aquila chrysaetos</i>	Sensitive ¹ , Not at Risk ²	open mountains, foothills, prairie, open habitats
grasshopper sparrow	<i>Ammodramus savannarum</i>	Sensitive ¹	grasslands, hayfields, prairie; tall grass, weeds, scattered shrubs; sometimes crop fields
great blue heron	<i>Ardea herodias</i>	Sensitive ¹	Freshwater and brackish marshes, along lakes, rivers, bays; nests colonially in large deciduous trees.
horned grebe	<i>Podiceps auritus</i>	Sensitive ¹ , Special Concern ^{2,3}	lakes with open water and marsh vegetation surrounded by prairie
lark bunting	<i>Calamospiza melanocorys</i>	Sensitive ¹ , Threatened ²	shortgrass prairie, sagebrush plains with understory of grass and weeds; prairie, agricultural fields, desert grassland, weedy vacant lots
least flycatcher	<i>Empidonax minimus</i>	Sensitive ¹	Aspen forests, alder and willow thickets, open woods, orchards; edge habitat
loggerhead shrike	<i>Lanius ludovicianus excubitorides</i>	Sensitive ¹ , Threatened ^{2,3} , Special Concern ⁴	Semi-open country with lookout posts, wires, trees, shrubs; open grasslands with

Common Name	Scientific Name	Conservation Status	Habitat Requirements
			few scattered trees, forest clearings
long-billed curlew	<i>Numenius americanus</i>	Sensitive ¹ , Special Concern ^{2,3,4}	Native dry grassland, sagebrush prairie, farmfields, marshes
McCown's longspur	<i>Rhynchophanes mccownii</i>	May be at Risk ¹ , Threatened ² , Special Concern ³	dry open prairie with short grass, patches of open ground; shortgrass plains, bare soil such as dry lake beds, plowed fields
northern harrier	<i>Circus cyaneus</i>	Sensitive ¹ , Not at Risk ²	Marshes, fields, prairies, wet meadows; open terrain, wet and dry habitats with good ground cover
olive-sided flycatcher	<i>Contopus cooperi</i>	May be at Risk ¹ , Threatened ^{2,3}	meadows, ponds, riparian forests, forest edges, open woodlands, mature spruce-fir forests
osprey	<i>Pandion haliaetus</i>	Sensitive ¹	large lakes, reservoirs, rivers; near water where large numbers of fish are present
peregrine falcon <i>anatum</i>	<i>Falco peregrinus anatum</i>	At Risk ¹ , Special Concern ^{2,3} , Threatened ⁴	Open country, cliffs, sometimes cities; variety of open habitats, near water, building ledges
pie-billed grebe	<i>Podilymbus podiceps</i>	Sensitive ¹	Ponds, marshes and backwaters with thick emergent vegetation.
pipin plover	<i>Charadrius melodus circumcinctus</i>	At Risk ² , Endangered ^{2,3,4}	Sandy beaches and open lakeshores; nests on open shoreline.
prairie falcon	<i>Falco mexicanus</i>	Sensitive ¹ , Not at Risk ² , Special Concern ⁴	Open hills, plains, prairies, deserts, grassland; open country above treeline in high mountains; farmland, lakes, reservoirs
rusty blackbird	<i>Euphagus carolinus</i>	Sensitive ¹	wet forests, areas with fens, bogs, muskeg, beaver ponds;

Common Name	Scientific Name	Conservation Status	Habitat Requirements
			overwinters in swamps, wet woodlands, and pond edges
sage thrasher	<i>Oreoscoptes montanus</i>	Undetermined ¹ , Endangered ^{2,3}	Sagebrush, shrubby slopes, deserts, wide-open flats, grassland with scattered shrubs
sandhill crane	<i>Grus canadensis</i>	Sensitive ¹	Open prairies, grasslands, isolated open marshes, fens and bogs surrounded by forests and shrubs.
sharp-tailed grouse	<i>Tympanuchus phasianellus</i>	Sensitive ¹	Prairie, shrub areas, forest edges, open burns in coniferous forest; mixture of open prairie with groves of deciduous trees or shrubs, such as aspen, birch, willow; open grasslands in summer; groves of trees and shrubs in winter
short-eared owl	<i>Asio flammeus</i>	May be at Risk ¹ , Special Concern ^{2,3}	Grassland, marshes, farmland, prairies, open country with high numbers of small rodents, stubble fields, small meadows, shrubby areas
sora	<i>Porzana carolina</i>	Sensitive ¹	Shallow freshwater emergent wetlands, bogs, fens, wet meadows and flooded fields
Sprague's pipit	<i>Anthus spragueii</i>	Sensitive ¹ , Threatened ^{2,3} , Special Concern ⁴	Native shortgrass prairie, plains, dry grassland, avoids brushy areas and cultivated fields. Winters in pastures, prairies, and grassy patches within fields of crops such as alfalfa
Swainson's hawk	<i>Buteo swainsoni</i>	Sensitive ¹	Open fields, dry grasslands, farmland, open areas with groves of trees, agricultural areas

Common Name	Scientific Name	Conservation Status	Habitat Requirements
upland sandpiper	<i>Bartramia longicauda</i>	Sensitive ¹	Hayfields, ungrazed pastures, grasslands, fields, open meadows; grasslands with tall grasses and broad-leafed weeds
western grebe	<i>Aechmophorus occidentalis</i>	At Risk ¹ , Special Concern ² , Threatened ⁴	Marshes, sloughs, rushy lakes; fresh water lakes with large areas of both open water and marsh vegetation
western wood-pewee	<i>Contopus sordidulus</i>	May be at Risk ¹	open woodlands, riparian forests, aspen groves, pine-oak woods, cottonwood-willow groves along streams
white-winged scoter	<i>Melanitta deglandi</i>	Sensitive ¹ , Special Concern ⁴	lakes, ponds, and slow-moving rivers, generally in open country
yellow rail	<i>Coturnicops noveboracensis</i>	Undetermined ¹ , Special Concern ^{2,3}	shallow sedge and grassy marshes, wet meadows; drier areas with dense stands of cordgrass
Mammals			
little brown bat	<i>Myotis lucifugus</i>	May be at Risk ¹ , Endangered ^{2,3}	large hollow trees, buildings near bodies of water, caves
red bat	<i>Lasiurus borealis</i>	Sensitive ¹	thick forest cover, open grassy areas; forages near farmlands
silver-haired bat	<i>Lasionycteris noctivagans</i>	Sensitive ¹	forests, parks, cities, farmland; hollow trees,
Western small-footed bat	<i>Myotis ciliolabrum</i>	Sensitive ¹ , Special Concern ⁴	arid prairie regions, riverbanks, ridges, outcroppings with lots of rocks; trees, buildings, rock crevices, under bridges and shingles of old buildings
American badger	<i>Taxidea taxus taxus</i>	Sensitive ¹ , Special Concern ²	grasslands, agricultural areas, open area, areas fragmented by roads, bush habitats with little groundcover

Common Name	Scientific Name	Conservation Status	Habitat Requirements
bobcat	<i>Lynx rufus</i>	Sensitive ¹	coniferous forests, deciduous forests, brushy areas, coulees
long-tailed weasel	<i>Mustela frenata longicauda</i>	May be at Risk ¹ , Not at Risk ²	open grasslands, tree groves, prairie, forests
pronghorn	<i>Antilocapra americana</i>	Sensitive ¹	arid grasslands, grassy brushlands, semi-desert regions
Reptiles			
bull snake	<i>Pituophis catenifer sayi</i>	Sensitive ¹ , Special Concern ²	prairies, grasslands, open grassy meadows bordered by woodland, wheat fields; loose sandy soil, near water sources; hibernacula found along river valleys, coulees, riparian/upland habitat transition zones
plains garter snake	<i>Thamnophis radix</i>	Sensitive ¹	margins of wetlands; wet meadows; open grasslands; hibernacula found along river valleys, coulees, riparian/upland habitat transition zones
prairie rattlesnake	<i>Crotalus viridis</i>	Sensitive ¹ , Special Concern ²	native grassland and sagebrush near a river valley or coulee, farm fields, pastures, rocky outcrops, sandy soil near boulder or rocky areas, stony canyons; 4hibernacula found along river valleys, coulees, riparian/upland habitat transition zones
wandering garter snake	<i>Thamnophis elegans</i>	Sensitive ¹	aquatic snake, open areas like meadows and estuaries, south facing rocky outcrops; hibernacula found along river valleys, coulees, riparian/upland habitat transition zones

Common Name	Scientific Name	Conservation Status	Habitat Requirements
western painted turtle	<i>Chrysemys picta</i>	Sensitive ¹ , Not at Risk ²	shallow waters of ponds, lakes, oxbows, marshes; slow-moving stream reaches, quiet backwater sloughs of rivers; muddy substrates, emergent aquatic vegetation, exposed cattail mats, logs, and open banks

- Notes: 1 Status assigned in the 2015 General Status of Alberta Wild Species (AEP 2017b)
 2 Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (Government of Canada 2017)
 3 Federal Species at Risk Act (SARA), Schedule 1, Public Registry (Government of Canada 2017)
 4 Wildlife Act, Alberta Queen's Printer, May 2012

APPENDIX B

SITE PHOTOS

**PHOTO 1; SURVEY
STATION 1**

Date:
October 23, 2017

Direction:
Southwest

Description:
View of the Project area
from survey station 1



**PHOTO 2;
WETLAND 1 AND 2**

Date:
May 22, 2017

Direction:
Northeast

Description:
Rainfall event the night
before photo. Partially
cultivated and partially
roadside ditch.

Wetland Classification:
M-G-sb-I



PHOTO 3; WETLAND

Date:

May 22, 2017

Direction:

Northwest

Description:

Wetland completely cultivated margins are difficult to distinguish. Rainfall event the night before picture

Wetland Classification:

M-G-sb-III



APPENDIX C

BREEDING BIRD RESULTS

TABLE 4. EARLY SPRING 2017 BREEDING BIRD SURVEY RESULTS

Survey Station	Station Location		Species	Count	Seen	Heard	Direction	Distance
	Latitude	Longitude						
S-1	49.29042	113.14859	Canada goose	2	x		NE	300
S-1	49.29042	113.14859	house sparrow	flock	x	x	NE	200
S-1	49.29042	113.14859	Franklin's gull	1	x		W	200
S-1	49.29042	113.14859	European starling	2	x		NE	200
S-1	49.29042	113.14859	ring billed gull	2	x		N	50
S-1	49.29042	113.14859	Canada goose	1	x		E	180
S-1	49.29042	113.14859	house sparrow	6	x		W	200
S-1	49.29042	113.14859	house sparrow	2	x	x	S	220
S-2	49.29049	113.16069	ring billed gull	1	x	x	NW	320
S-2	49.29049	113.16069	vesper sparrow	1		x	N	120
S-2	49.29049	113.16069	savannah sparrow	1		x	W	100
S-2	49.29049	113.16069	savannah sparrow	1		x	E	50
S-2	49.29049	113.16069	mallard	3	x		E	300
S-3	49.28202	113.16503	vesper sparrow	1		x	E	200
S-3	49.28202	113.16503	ring billed gull	1	x		W	150
S-3	49.28202	113.16503	northern shoveler	2	x		S	400
S-3	49.28202	113.16503	Canada goose	4	x	x	NW	400
S-3	49.28202	113.16503	American crow	1	x		n/a	0
S-3	49.28202	113.16503	savannah sparrow	1		x	SW	150
S-3	49.28202	113.16503	vesper sparrow	1		x	SW	280
S-3	49.28202	113.16503	American robin	1		x	SE	200
S-3	49.28202	113.16503	long billed curlew	1	x		SE	280

TABLE 5. LATE SPRING 2017 BREEDING BIRD RESULTS

Survey Station	Station Location		Species	Count	Seen	Heard	Direction	Distance
	Latitude	Longitude						
S-1	49.29042	113.14859	savannah sparrow	1	x		n/a	≤100
S-1	49.29042	113.14859	mourning dove	1	x		n/a	>100
S-1	49.29042	113.14859	Wilson's snipe	1		x	n/a	>100
S-1	49.29042	113.14859	house sparrow	6	x		n/a	≤100
S-1	49.29042	113.14859	brown headed cowbird	3	x		n/a	≤100
S-1	49.29042	113.14859	killdeer	1	x		n/a	≤100
S-1	49.29042	113.14859	black billed magpie	2	x		n/a	≤100
S-2	49.29049	113.16069	savannah sparrow	1	x		n/a	≤100
S-2	49.29049	113.16069	horned lark	1	x		n/a	≤100
S-2	49.29049	113.16069	red-tailed hawk	1	x		n/a	>100
S-2	49.29049	113.16069	ring billed gull	4	x		n/a	>100
S-2	49.29049	113.16069	long billed curlew	1		x	n/a	>100
S-3	49.28202	113.16503	savannah sparrow	1		x	n/a	≤100
S-3	49.28202	113.16503	horned lark	1		x	n/a	≤100
S-3	49.28202	113.16503	Wilson's phalarope	2	x		n/a	≤100
S-3	49.28202	113.16503	gadwall	20	x		n/a	≤100
S-3	49.28202	113.16503	American wigeon	7	x		n/a	≤100
S-3	49.28202	113.16503	mallard	6	x		n/a	≤100
S-3	49.28202	113.16503	killdeer	4	x		n/a	≤100
S-3	49.28202	113.16503	northern pintail	4	x		n/a	≤100
S-3	49.28202	113.16503	blue winged teal	8	x		n/a	≤100
S-3	49.28202	113.16503	Wilson's snipe	2	x		n/a	≤100
S-3	49.28202	113.16503	northern shoveler	2	x		n/a	≤100

APPENDIX D

MIGRATORY BIRD RESULTS

TABLE 6. SPRING 2017 MIGRATORY BIRD SURVEY RESULTS

Migration Timing ¹	Survey Station	Station Location		Species	Count	Seen	Heard	FlyBy	Direction	Distance
		Latitude	Longitude							
Early	S-1	49.29042	113.1486	ring billed gull	20	x			N	200
Early	S-1	49.29042	113.1486	ring billed gull	8	x			N	200
Early	S-1	49.29042	113.1486	European starling	12	x		x	n/a	0
Early	S-2	49.29049	113.1607	horned lark	1	x			W	20
Early	S-2	49.29049	113.1607	Canada goose	2	x		x	n/a	0
Early	S-2	49.29049	113.1607	ring billed gull	4	x			n/a	0
Early	S-2	49.29049	113.1607	ring billed gull	14	x			N	100
Early	S-3	49.28202	113.165	tundra swan	18	x			W	600
Mid	S-1	49.29042	113.1486	house sparrow	15	x			E	75
Mid	S-1	49.29042	113.1486	herring gull	2	x		x	n/a	0
Mid	S-1	49.29042	113.1486	ring billed gull	15	x			N	100
Mid	S-1	49.29042	113.1486	European starling	5	x			E	50
Mid	S-1	49.29042	113.1486	killdeer	1		x		SW	150
Mid	S-1	49.29042	113.1486	western meadowlark	1		x		S	20
Mid	S-1	49.29042	113.1486	Hungarian partridge	2	x			N	15
Mid	S-1	49.29042	113.1486	ring billed gull	15	x			N	200
Mid	S-2	49.29049	113.1607	long billed curlew	2	x			N	70
Mid	S-2	49.29049	113.1607	tundra swan	7	x			S	200
Mid	S-2	49.29049	113.1607	mallard	2	x			W	100
Mid	S-2	49.29049	113.1607	ring billed gull	4	x			NW	150
Mid	S-3	49.28202	113.165	common raven	1	x			N	80
Mid	S-3	49.28202	113.165	horned lark	2	x	x		NW	70
Mid	S-3	49.28202	113.165	Franklin's gull	3	x		x	n/a	0
Late	S-1	49.29042	113.1486	Canada goose	2	x			NE	300
Late	S-1	49.29042	113.1486	house sparrow	flock	x	x		NE	200

Migration Timing ¹	Survey Station	Station Location		Species	Count	Seen	Heard	FlyBy	Direction	Distance
		Latitude	Longitude							
Late	S-1	49.29042	113.1486	Franklin's gull	1	x			W	200
Late	S-1	49.29042	113.1486	European starling	2	x			NE	200
Late	S-1	49.29042	113.1486	ring billed gull	2	x			N	50
Late	S-1	49.29042	113.1486	Canada goose	1	x			E	180
Late	S-1	49.29042	113.1486	house sparrow	6	x			W	200
Late	S-1	49.29042	113.1486	house sparrow	2	x	x		S	220
Late	S-2	49.29049	113.1607	ring billed gull	1	x	x		NW	320
Late	S-2	49.29049	113.1607	vesper sparrow	1		x		N	120
Late	S-2	49.29049	113.1607	savannah sparrow	1		x		W	100
Late	S-2	49.29049	113.1607	savannah sparrow	1		x		E	50
Late	S-2	49.29049	113.1607	mallard	3	x			E	300
Late	S-2	49.28202	113.165	vesper sparrow	1		x		E	200
Late	S-3	49.28202	113.165	ring billed gull	1	x			W	150
Late	S-3	49.28202	113.165	northern shoveler	2	x			S	400
Late	S-3	49.28202	113.165	Canada goose	4	x	x		NW	400
Late	S-3	49.28202	113.165	American crow	1	x		x	n/a	0
Late	S-3	49.28202	113.165	savannah sparrow	1		x		SW	150
Late	S-3	49.28202	113.165	vesper sparrow	1		x		SW	280
Late	S-3	49.28202	113.165	American robin	1		x		SE	200
Late	S-3	49.28202	113.165	long billed curlew	1	x			SE	280

Note: ¹ Early: April 5, Mid:April 18, Late: May 3

TABLE 7. FALL 2017 MIGRATORY BIRD SURVEY RESULTS

Migration Timing ¹	Survey Station	Station Location		Species	Count	Seen	Heard	FlyBy	Direction	Distance
		Latitude	Longitude							
Early	S-1	49.29042	113.1486	barn swallow	2	x			NE	60
Early	S-1	49.29042	113.1486	Canada goose	2	x		x	N	0
Early	S-1	49.29042	113.1486	double crested cormorant	14	x		x	N	0
Early	S-1	49.29042	113.1486	house sparrow	6	x	x		NE	60
Early	S-1	49.29042	113.1486	raptor ssp.	4	x		x	N	400
Early	S-1	49.29042	113.1486	ring billed gull	3	x			N	350
Early	S-1	49.29042	113.1486	savannah sparrow	1	x			W	20
Early	S-2	49.29049	113.1607	common raven	1	x			N	200
Early	S-2	49.29049	113.1607	savannah sparrow	1	x			S	40
Early	S-3	49.28202	113.165	sparrow ssp.	2	x		x	N	600
Early	S-3	49.28202	113.165	sparrow ssp.	1	x			S	20
Mid	S-1	49.29042	113.1486	Canada goose	15	x			N	100
Mid	S-1	49.29042	113.1486	house sparrow	6	x	x		E	60
Mid	S-1	49.29042	113.1486	Hungarian partridge	10	x			N	60
Mid	S-1	49.29042	113.1486	ring billed gull	4	x			N	150
Mid	S-2	49.29049	113.1607	Canada goose	300	x			N	500
Mid	S-2	49.29049	113.1607	Canada goose	60	x			W	400
Mid	S-3	49.28202	113.165	American pipit	21	x	x	x	SW	0
Mid	S-3	49.28202	113.165	Canada goose	16	x			W	250
Late	S-1	49.29042	113.1486	Canada goose	40	x	x		W	500
Late	S-1	49.29042	113.1486	Canada goose	4	x			W	500
Late	S-1	49.29042	113.1486	European starling	11	x	x		E	200
Late	S-1	49.29042	113.1486	gull ssp.	3	x			W	200
Late	S-1	49.29042	113.1486	Hungarian partridge	15	x			E	200
Late	S-1	49.29042	113.1486	Lapland longspur	3	x	x	x	N	0
Late	S-1	49.29042	113.1486	ring billed gull	5	x			E	100
Late	S-1	49.29042	113.1486	ring billed gull	10	x			E	100
Late	S-1	49.29042	113.1486	trumpeter swan	2	x		x	W	400

Migration Timing ¹	Survey Station	Station Location		Species	Count	Seen	Heard	FlyBy	Direction	Distance
		Latitude	Longitude							
Late	S-1	49.29042	113.1486	tundra swan	9	x			W	400
Late	S-1	49.29042	113.1486	tundra swan	2	x			E	200
Late	S-2	49.29049	113.1607	Canada goose	13	x	x		NW	500
Late	S-2	49.29049	113.1607	Canada goose	58	x			W	500+
Late	S-2	49.29049	113.1607	common raven	3	x			W	200
Late	S-2	49.29049	113.1607	European starling	1	x			W	200
Late	S-2	49.29049	113.1607	horned lark	1		x		W	200
Late	S-2	49.29049	113.1607	tundra swan	11	x			W	200
Late	S-3	49.28202	113.165	common raven	3	x			W	300
Late	S-3	49.28202	113.165	horned lark	2	x			NW	100
Late	S-3	49.28202	113.165	horned lark	1		x		E	100

Note: ¹ Early: August 31, Mid: September 26, Late: October 23

APPENDIX E

SPRING COULEE SOLAR PROJECT

SITE PLAN

APPENDIX F

WETLAND ASSESSMENT AND IMPACT REPORT

Solar Krafte Utilities Inc.

Spring Coulee Solar Project

Wetland Assessment and Impact Report

REFERENCE NUMBER: B-0053-17



Prepared by:

Basin Environmental Ltd.

115 Nottingham Road
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Prepared for:

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APPENDICES

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Appendix B	Site Photos
Appendix C	Database Search Results

CONCORDANCE REQUIREMENTS OF WAIR

Requirement	Section Number Where Located
Name and professional designation of the individual(s) who conducted the Wetland Assessment and Impact Report (WAIR)	Section 7
Date of assessment	Section 2.1
Overview of the project area	Section 2; Figure 1 and 2
Documentation of procedures and evidence used to determine the wetland delineation in accordance with the Alberta Wetland Identification and Delineation Directive	Section 4.3
Documentation and evidence used to determine wetland classification, in accordance with the Alberta Wetland Classification System (AWCS)	Section 4.6
Description of pre-disturbance vegetation, soils and hydrology of each wetland	Section 4.6
Photographs of each wetland, with GPS coordinates, figure captions and descriptions that illustrate the wetland class and vegetation communities within the wetland	Appendix B
Alberta Wetland Rapid Evaluation Tool – Actual (ABWRET-A). This must include the ‘AllSitesA’ worksheet	Appendix C
A Landscape Analysis Tool (LAT) report	Section 4.1.2 Appendix C
Alberta Conservation Information Management System (ACIMS), Fisheries and Wildlife Management Information System (FWMIS) search results	Section 4.1.2 Section 4.1.3 Appendix C
A list of dominant vegetation species found within each wetland	Section 4.6; Table 4
A list of sensitive, rare or endangered plant and wildlife species incidentally observed during the wetland assessment as deemed necessary or requested by the regulatory body	Section 4.4; Table 3
Methods and results of any species surveys that were conducted	Section 4.4
Description of all anticipated impacts to wetlands	Section 5.2
Avoidance, which must be a consideration	Section 5.1

Requirement	Section Number Where Located
Minimization of impacts	Section 5.3
Replacement outlining how replacement obligations will be fulfilled where avoidance and minimization is not feasible or is considered ineffective	Section 6

1.0 INTRODUCTION

Solar Krafte Utilities Inc. (Solar Krafte), Belectric and innogy SE propose to permit, construct and operate the Spring Coulee Solar Project, a 29.5 megawatt (MW) Solar Photovoltaic (PV) facility located approximately 9 kilometres (km) southwest of Spring Coulee, Alberta (the Project). The Project is located in the White Area of Alberta in NW-10-4-24 W4M, the northwest half of NE-10-4-24 W4M and in the northwest corner of SW 10-4-24 W4M (Figure 1).

The Project will consist of flat, single access trackers with solar PV modules set up in a north/south direction to allow the solar PV system to track/ tilt with the sun in an east to west direction. Computer controlled electric motors will power the trackers. The Project will transfer electric power generated by the solar PV system through underground cables and directly into 25 kilovolt (kV) Fortis Alberta distribution feeders located on the roadway. One Class VI access road will be constructed from Township Road 42 to allow access to the electrical inverters. Construction of the Project is anticipated to occur between October of 2018 and September of 2019.

The specific make and model of the solar PV modules have not yet been identified. However, the total number of modules installed is not expected to exceed 295,000, and given advancement in solar PV technology, it is expected that the impacted area may be reduced prior to commercial operation. For the design reference case, the Project is using 292,620 First Solar FS-4120-3 modules. These modules are 1.2 meters (m) in length and 0.6 m in width, and each produces 120 watts of DC power. The modules are mounted 4 wide on the tracker, for a total array width of 2.54 m. The module racking allows for small gaps between the modules, ergo individual drip edges, thus no material impact on storm-water attenuation. The trackers are installed 3.81 m apart.

Basin Environmental Ltd. (Basin) was retained by Solar Krafte to prepare a Wetland Assessment and Impact Report (WAIR). The WAIR provides details on the proposed Project along with the methods used to classify, map, and describe the wetlands within the Project area, including an analysis of historical aerial photographs and a field survey. Impacts to wetlands within the Project area are identified along with associated compensation requirements under the Alberta Wetland Policy (2013).

2.0 STUDY AREA

The Project area includes all lands with the potential to be directly impacted by construction and operation of the proposed facility, plus an additional 100 m buffer, the buffer area recommended by AEP for permanent wetlands. In total, three wetlands were identified within the Project area (Figure 2). Land use within the Project area is primarily agricultural crop cultivation.

The Project is located within the Dry Mixedgrass Natural Subregion (NSR) in the Grassland Natural Region (NR) of Alberta (Natural Regions Committee 2006). The Grassland NR, also known as the Prairies, is the driest, warmest and the most agriculturally fertile region in Alberta. Distinct habitats in this region include sand plains, dune fields, rocky outcrops and badlands, which provide important breeding habitat for several species of concern and local wildlife (Alberta Parks 2014). The Dry Mixedgrass NSR has numerous distinct wildlife and plant species found nowhere else in Alberta that inhabit stream valleys, tall shrub and woodland communities (Alberta Parks 2014). The landscape is characterized by gentle, undulating terrain broken up by coulees, valleys, dune fields and badlands. This subregion gets very little precipitation and has hot summers, dry winds, high evaporation rates and long, cold winters with little snow cover (Alberta Parks 2014).

The total Project area is **80 hectares (ha)**; the proposed Project footprint will be **27.8 ha**, which represents a 34.7% coverage, consisting predominantly of the solar arrays.



FIGURE 1 OVERVIEW MAP OF THE STUDY AREA. WETLAND DELINEATED IN PINK

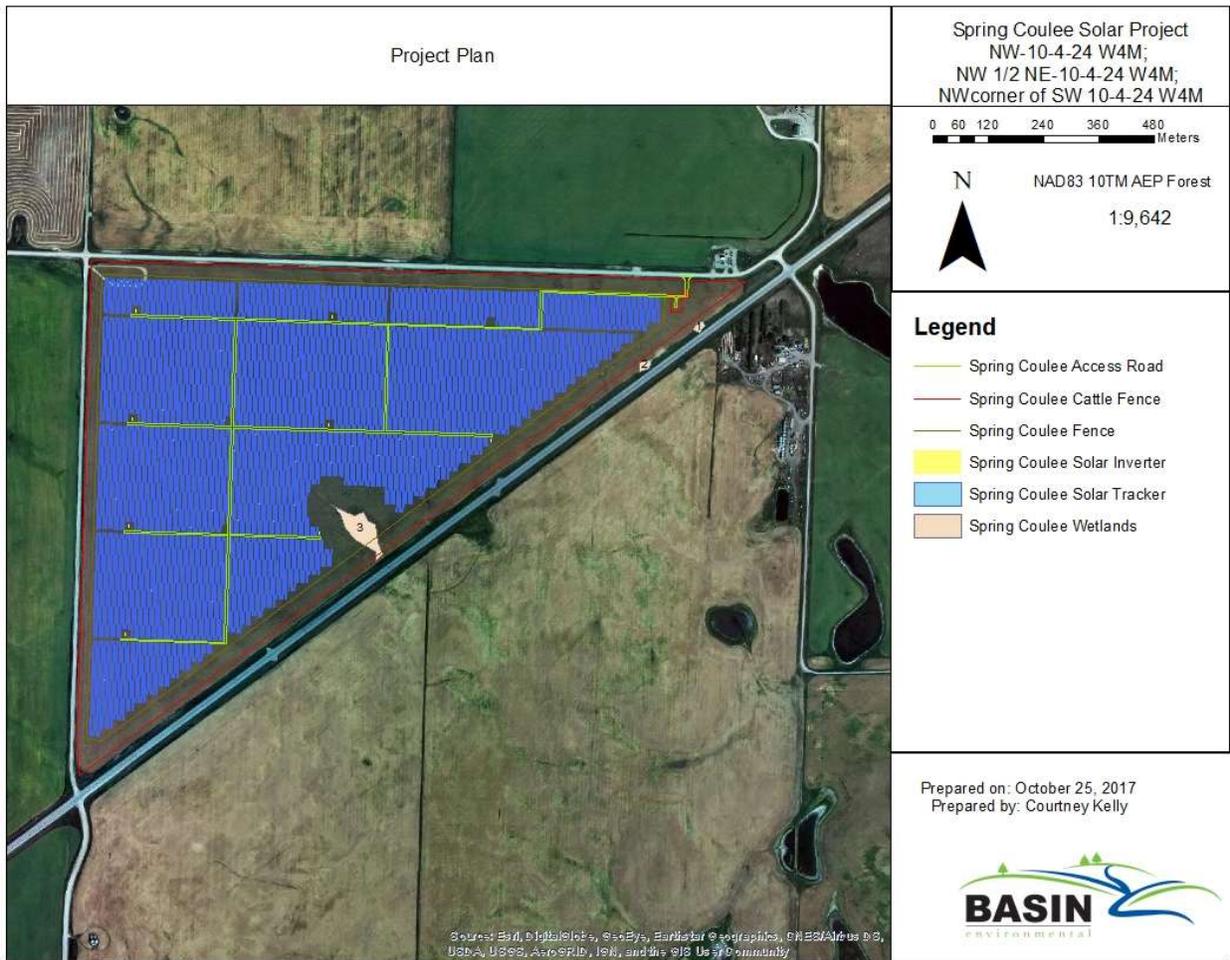


FIGURE 2 PROJECT PLAN IN RELATION TO WETLANDS

2.1 STUDY OBJECTIVES

In accordance with Alberta Environment and Parks (AEP) requirements, an Approval under the *Water Act* must be obtained following a consultation with a Wetland Specialist and AEP. A wetland assessment must be conducted in accordance with the Alberta Wetland Policy (Government of Alberta 2013b).

Basin was retained by Solar Krafte to prepare the WAIR as a requirement of the *Water Act* application. This assessment consisted of a desktop review, which included an examination of historical aerial photographs, in combination with a field assessment conducted on May 22, 2017, within the Project area.

The objective of this assessment is to locate, classify and delineate wetlands within the Project area; to identify wetlands that will be directly or indirectly impacted by the proposed Project; and, to provide recommendations for a wetland mitigation decision framework.

3.0 METHODS

3.1 WETLAND DELINEATION AND CLASSIFICATION

A wetland is an ecosystem dominated by hydrophytic vegetation where soils are water-saturated for a sufficient length of time and various kinds of biological activities and processes have developed that are adapted to a wet environment. As a result, excess water and resulting low soil oxygen levels are principal determinants of vegetation and soil development (Government of Alberta 2015b). Wetlands were initially identified using available aerial photographs (Appendix A) as described in the Guide for Assessing Permanence of Wetland Basins (Government of Alberta 2016). Delineation of wetlands was done in accordance with the Alberta Wetland Identification and Delineation Directive (Government of Alberta 2015a).

Wetlands were classified in accordance with the Alberta Wetland Classification System (AWCS; Government of Alberta 2015b). The AWCS was developed and implemented by the Government of Alberta in 2015 and is specifically tailored to wetlands in Alberta. There are five classes of wetlands under the AWCS: bogs, fens, marshes, shallow open water, and swamps. These classes align with the Canadian Wetland Classification System (1997). The five wetland classes were further divided into “forms” based on vegetation structure and these forms were further subdivided into “types” based on the length of time surface water is at, or above, surface level and acidity/alkalinity. Table 1 summarizes the breakdown of wetland classes, forms and types in Alberta.

TABLE 1 ALBERTA WETLAND CLASSIFICATION SYSTEM

Class	Form	Type		
		Salinity	Water Permanence	Acidity-alkalinity
Bog [B]	Wooded, coniferous [Wc], Shrubby [S], Graminoid [G]	Freshwater [f]	-	Acidic [a]
Fen [F]	Wooded, coniferous [Wc], Shrubby [S], Graminoid [G]	Freshwater [f] to slightly brackish [sb]	-	Poor [p] Moderate rich [mr] Extreme rich [er]
Marsh [M]	Graminoid [G]	Freshwater [f]	Temporary [II]	-
		Freshwater [f]	Seasonal [III]	-
		Freshwater [f] to slightly brackish [sb]	Semi-permanent [IV]	-
Shallow Open Water [W]	Submersed and/or aquatic vegetation [A] or bare [B]	Freshwater [f] to moderately brackish [mb]	Seasonal [III]	-
		Freshwater [f] to sub-saline [ss]	Semi-permanent [IV]	-
		Slightly brackish [sb] to sub-saline [ss]	Permanent [V]	-
	[A]	Saline [s]	Intermittent [VI]	-
Swamp [S]	Wooded coniferous [Wc], wooded mixedwood [Wm], wooded deciduous [Wd], Shrubby [S]	Freshwater [f] to slightly brackish [sb] ²	Temporary [II]	-
		Freshwater [f] to slightly brackish [sb]	Seasonal [III]	-
		Moderately brackish [mb] to sub-saline [ss]	Seasonal [III]	-

3.2 WETLAND BOUNDARIES MAPPING

Wetlands were delineated according to Pathway 3 of the Alberta Wetland Identification and Delineation Directive (Government of Alberta 2017a). Wetlands were identified and delineated based on the observations of the following biophysical features:

- the occurrence and visible extent of wetland vegetation, where the wetland boundary is defined by the point where the abundant plant species are made up of less than 50% of facultative or obligate wetland species;
- presence of hydric soils;

- hydrology which includes the occurrence and visible extent of seasonal flooding; and,
- observed changes in grade from lowland to upland.

3.3 AERIAL IMAGERY INTERPRETATION

Historical aerial photography taken between 1961 and 2012 (Appendix A), at various scales, was used to develop a long-term account of wetland presence and calculate wetland coverage within the Project area. Initial wetland classification was premised upon aerial imagery interpretation in accordance with the Guide for Assessing Permanence of Wetland Basins (Government of Alberta 2016). That information was later used to support field data in the delineation of the occurrence and approximate extent of wetland boundaries.

Photos were selected to provide a range of seasons in both wet and dry years to ensure a complete picture of the conditions of wetlands in the Project area. A selection of wet/dry/normal years was used in conjunction with historical climate data referenced from Alberta Climate and Atlas Maps (Alberta Agriculture and Forestry [AAF] 2017). An analysis of historical aerial photographs provides a record of changing land use and conditions over time. Appendix A summarizes the historical aerial photographs obtained from the Airphoto Library in Edmonton and Bing Imagery.

3.4 BACKGROUND REVIEW

A desktop review was conducted on the following databases to identify potential environmental sensitivities and/or areas of operational constraints that may apply to the Project.

- Agricultural Regions of Alberta Soil Inventory Database (AGRASID)
- Fisheries and Wildlife Management Information System (FWMIS)
- Alberta Conservation Information Management System (ACIMS)
- Environmentally Significant Areas (ESAs)
- Historic Resource Values (Historic Resources Management Branch 2015)
- Landscape Analysis Tool (LAT)

3.5 FIELD SURVEY

A field survey was conducted by Courtney Kelly, B.Sc., P.Biol., of Basin on May 22, 2017. Soils, vegetation, hydrology and water chemistry were examined to document, classify and delineate wetlands. Wetlands were delineated using a handheld GPS, and the delineation was verified using a number of representative points

Soils were examined to a depth of 30 cm within the unsaturated outer zone of the wetland. Depth, horizon, texture, colour (Munsell colour chart) and presence of redox features, such as gleying and mottling, were recorded. The location of all soil pits was noted, and pictures of soils were taken.

Vegetation was sampled using one randomly placed 1 m by 1 m plots. One plot at each wetland assessed percent cover for all of the species at each stratum (i.e., ground, submergent, shrub and tree). Percent cover of dominant vascular species and percent cover of total vascular species, litter, bare ground and open water were also recorded.

Topography of the site and evidence of ponding were used as evidence to assess hydrology. Depth of water and water chemistry was taken at all wetlands with water present using a handheld water quality meter. Water chemistry readings included pH, conductivity (adjusted for temperature), and temperature.

4.0 RESULTS

4.1 BACKGROUND REVIEW

4.1.1 AGRICULTURAL REGIONS OF ALBERTA SOIL INVENTORY DATABASE (AGRASID)

The Project area is located within soil polygon identified as No. 5525. The landscape is described as hummocky or low relief with a limiting slope of 6%. Soils for this polygon are described as Orthic Black Chernozem on medium textured till (L, CL) (AEP 2015).

4.1.2 FISH AND WILDLIFE MANAGEMENT (FWMIS) AND LANDSCAPE ANALYSIS TOOL (LAT)

Sensitive features that overlap the Project area include the Sharp-tailed Grouse Survey Area, Sensitive Raptor Range (i.e., bald eagle, ferruginous hawk, golden eagle, peregrine falcon and prairie falcon) and Other Sensitive and Endangered Species (Government of Alberta 2017). The Project is not located within any Key Wildlife or Biodiversity Zones; however, the St. Mary River, located approximately 7.0 km southwest of the Project area, is a Key Wildlife and Biodiversity Zone.

The Project is located in Bird Conservation Region 11, the Prairie Potholes Region (Environment Canada 2013). Despite the conversion of prairie and wetland habitat for agricultural use, this region is one of the most important breeding areas within North America for waterfowl, particularly dabbling and diving ducks (Environment Canada 2013). It also provides critical

migratory and breeding habitat to over 200 other bird species. Within this region, bird species at risk primarily utilize habitats associated with wetlands, cultivated areas and waterbodies (Environment Canada 2013).

The Project does not occur within any Important Bird Areas (IBA); however, St. Mary Reservoir (AB011) is located approximately 1.8 km north, and is an IBA (Bird Studies Canada and Nature Canada 2010). The St. Mary Reservoir is a globally and nationally significant IBA for congregatory species. A globally significant population of California gull (*Larus californicus*) have been recorded at the St. Mary’s Reservoir. American white pelicans (*Pelecanus erythrorhynchos*) are sometimes present at the reservoir in nationally significant numbers. Other colonial nesters also nest at the St. Mary Reservoir, including ring-billed gull (*Larus delawarensis*) and double-crested cormorants (*Phalacrocorax auritus*). Non-breeding eared grebes (*Podiceps nigricollis*) and common terns (*Sterna hirundo*) also use the St. Mary’s Reservoir during summer months (Bird Studies Canada 2017, Nature Alberta 2014).

A search of the FWMIS database (AEP 2017) and FWMIS records revealed four wildlife species of concern (Table 2).

TABLE 2 WILDIFE SPECIES AT RISK DOCUMENTED WITHIN THE PROJECT AREA

Common Name	Scientific Name	Provincial Designation		Federal Designation	
		Wild Species ¹	Wildlife Act ²	COSEWIC ³	SARA ⁴
Birds					
Eastern kingbird	<i>Tyrannus tyrannus</i>	Sensitive	Not Listed	Not Listed	No Status
Long-billed curlew	<i>Numenius americanus</i>	Sensitive	Special Concern	Special Concern	Special Concern
Prairie falcon	<i>Falco mexicanus</i>	Sensitive	Special Concern	Not at Risk	No Status
Mammals					
Pronghorn	<i>Antilocapra americana</i>	Sensitive	Not Listed	Not Listed	No Status

Notes: 1 Status assigned in the 2015 General Status of Alberta Wild Species (AEP 2017a)
 2 *Wildlife Act*, Alberta Queen’s Printer, May 2012.
 3 Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (Government of Canada 2017)

4.1.3 ALBERTA CONSERVATION INFORMATION MANAGEMENT SYSTEM (ACIMS)

A search of ACIMS revealed no sensitive plant species within the Project area (AEP 2011); however, the absence of any records of rare species in the Project area does not preclude their

presence in the Project area, it simply indicates that a rare species survey likely has never been conducted in the Project area.

4.1.4 ENVIRONMENTALLY SIGNIFICANT AREAS

No Environmentally Significant Areas (ESA) are located within the Project area; however, based on the most recent ESA study (Fiera Biological Consulting Ltd. [Fiera] 2014), ESAs are present in properties adjacent to the Project area, including wetlands in the property immediately east, and approximately 1.0 km south of the Project area. The ESAs scored high in Criterion 3 (i.e., ecological integrity) based on the new Fiera (2014) criteria for ESAs. In addition, sections of the St. Mary Reservoir are also ESAs, scoring high in Criterion 3 and Criterion 4 (i.e., contributing to water quality and quantity), and the St. Mary Reservoir is nationally significant due to the presence of breeding California gulls, in addition to providing habitat for other waterfowl (see Section 4.1.2; Sweetgrass 1997).

4.1.5 CROWN OWNERSHIP AND HISTORIC RESOURCES

No Crown ownership claim or Crown surface dispositions are recorded for the Project area (AltaLIS 2013). A *Public Lands Act* water boundaries review was not completed because wetlands potentially affected by the Project do not meet the criteria for Crown ownership. The Seasonal wetland impacted by the Project is considered highly disturbed and does not have characteristics that support water permanency and aquatic vegetation.

First Nation consultation was not completed, as the Project is not within any identified Historic Resources Lands (Government of Alberta 2017).

4.2 AERIAL IMAGERY INTERPRETATION

Six historical aerial photos spanning a period from 1961 to 2012 were utilized in the analysis and were obtained from the Edmonton Airphoto Library and Bing Imagery. Land use showed that crop cultivation dominated current and past land use within the Project area. Impacts from cultivation within the subject wetlands and surrounding lands appears consistent over the period of analysis. It is unknown when the area was originally cleared for agricultural use. A total of three wetlands were identified within the Project area (Appendix B)

Of the three wetlands identified within the Project area, 2 wetlands were ephemeral and 1 wetland was seasonal. Ephemeral wetlands are characterized as low depressions with standing water for only short periods following heavy precipitation events or snow/ice melt in the spring. The brief periods when standing water is present in these wetlands are not long enough to promote the formation of water-altered soils within 30 centimeters (cm) of the ground surface or

the establishment of water-tolerant vegetation communities (Government of Alberta, 2015b). Seasonal wetlands are typically flooded for most of the growing season but have little to no surface water remaining by the end of summer. Seasonal wetlands have water-altered soils within 30 cm of ground surface and are characterized by the presence of water-tolerant vegetation communities (Government of Alberta, 2015b).

4.3 WILDLIFE

Wetlands were not considered ideal for supporting waterbirds due to lack of surface water. Point count surveys and targeted wildlife surveys (e.g., burrowing owl, sharp-tailed grouse, amphibian and raptor) were conducted during the spring of 2017. Targeted surveys did not identify any sensitive species within the Project area and the 1 km buffer. Details on these surveys can be found in the Spring Coulee Solar Project Wildlife Assessment Report (Basin 2017).

During the May 22, 2017, field assessment, incidental wildlife occurrences were observed in the Project area (Table 3).

TABLE 3 INCIDENTAL WILDLIFE OBSERVED

Common Name	Latin Name
California gull	<i>Larus californicus</i>

4.4 RARE PLANTS

No rare plants were identified during the field surveys. Rare plants and rare ecological community presence is considered unlikely due to ongoing crop cultivation throughout the Project area.

4.5 WETLAND CLASSIFICATION RESULTS

Three wetlands were identified in the Project area prior to the field assessment. All wetlands were assessed and biophysical features were recorded. Wetlands 1 and 2 were partially cultivated at the time of the assessment. Wetland 3 was completely cultivated and considered highly disturbed. Thus, organic surface matter and soil horizons were not evident. Additionally, agricultural practices removed all wetland-dependent vegetation species. All the wetlands contained surface water at the time of assessment due to a recent rainfall event. A culvert under Highway 5 is also a source of surface water inflow for Wetland 3. Tables 4 and 5 detail the field indicators observed for all wetlands within the Project area.

TABLE 4 FIELD INDICATORS USED TO IDENTIFY AND DELINEATE WETLANDS

Wetland ID	Wetland Class	Size (ha)	Plot Technique (m)	Location (UTM)	Common Name	Scientific Name	Facultative or Obligate Species (Y/N)	Percent Cover (%)
Wetland 1	M-G-sb-I	0.04	1x1	12U 343912 5461842	Fowl bluegrass	<i>Poa palustris</i>	N	20
					Dandelion	<i>Taraxacum officinale</i>	N	5
					Alsike clover	<i>Trifolium hybridum</i>	N	Trace
					Common plantain	<i>Plantago major</i>	Y	2
					Quack grass	<i>Elymus repens</i>	N	Trace
Wetland 2	M-G-sb-I	0.05	1x1	12U 343793 5461767	Fowl bluegrass	<i>Poa palustris</i>	N	10
					Dandelion	<i>Taraxacum officinale</i>	N	5
					Common plantain	<i>Plantago major</i>	Y	2
Wetland 3	M-G-sb-III	0.64	1x1	12U 343180 5461423	Cultivated	N/A	N/A	N/A

TABLE 5 INFORMATION AND EVIDENCE TO CLASSIFY WETLANDS

Wetland ID	Location (UTM)	Classification	Soil Characteristics	Hydrologic Characteristics	Vegetation Characteristics	Indicator Species
Wetland 1	12U 343912 5461842	M-G-sb-I	Soil disturbed	pH = 4.8 Conductivity = 718 µS/cm Water depth = 4 cm	Partially cultivated. Area that is not cultivated is disturbed and hosts a variety of weed species	1. Common plantain
Wetland 2	12U 405907 5460185	M-G-sb-I	Soil disturbed	pH = 4.8 Conductivity = 718 µS/cm Water depth = 4 cm	Mostly cultivated. Area that is not cultivated is disturbed and hosts a variety of weed species	1. Common plantain
Wetland 3	12U 405804 5460056	M-G-sb-III	Soil disturbed	pH = 4.6 Conductivity = 748 µS/cm Water depth = 6 cm	Cultivated	N/A

5.0 WETLAND AVOIDANCE AND MINIMIZATION

5.1 AVOIDANCE

Three wetlands were identified within the Project area; given the size of the facility and land constraints, impacts to all the wetlands will not be avoidable; however, Solar Krafte diligently tried to avoid as many wetlands as possible. Upon the recommendation of wetland professionals, Solar Krafte worked with their engineers to develop a site plan that avoids the placement of solar arrays within any of the wetlands. Wetland 3, a seasonal wetland, will be avoided and given a buffer of 50 m from all solar arrays. However, all the wetlands are located on the southern periphery of the Project area and the Project requires a cattle fence surrounding the periphery. Therefore, the fence must run through a small area of all of the wetlands in order to maintain a fenced perimeter. Inverter pads will not be placed in any of the wetlands (Figure 3).

5.2 IMPACTS TO WETLANDS

Module array supports, underground conductor runs, and access roads are not anticipated to impact any of the wetlands in the Project area. Posts and fencing are the only anticipated impacts within all three wetlands. The site plan for the Project, including an access road cross-section, is shown in Figure 3.

The total Project area is **80 ha**, and of this total area, the proposed Project footprint will be **27.8 ha**. This represents a 34.7% coverage of the Project area, which consist primarily of solar modules. In total, three wetlands with a combined area of **0.73 ha**, were assessed. The anticipated area of impact for all the wetlands within the Project area is **0.00027 ha** (fence posts and fencing).

Due to the tilt of the PV arrays, some areas of the wetlands will be shaded more frequently during parts of the day, which may result in a change of vegetation composition; however, this is not considered a permanent impact and does not require compensation (Matthew Wilson, Wetland Restoration and Compensation Specialist, AEP [pers. comm., July 10, 2017]).

5.2.1 HYDROLOGY

Water quantity within the local wetlands may increase due to increased runoff from solar arrays and access roads. The hydroperiod may also increase in length, due to an increase in runoff. Additionally, the use of outsourced water for the cleaning of dirt/dust from solar arrays may introduce a new source of surface water to the local area, which may result in significant impacts

to local and regional hydrology. It may also result in an increase in sedimentation and nutrients to surface water resources, such as the wetlands in the Project area.

It is recommended that a water management plan be developed and integrated into the construction and operation phases of the Project. The water management plan should seek to reduce surface runoff, reduce water usage on site and minimize the potential for sedimentation to local wetlands.

Sedimentation can alter the aquatic environment, including basic wetland functions related to water quality and nutrient cycling. Sedimentation within wetlands is significantly exacerbated in agricultural fields. Cultivated wetlands receive more sediment from upland areas through land use practices (Gleason and Euliss 1998). As these wetlands have been historically cultivated for over 50 years, the rates of sediment accumulation in the wetlands are expected to decrease from current conditions. The elimination of crop cultivation is anticipated to improve hydrology and nutrient distribution within the Project area.

5.2.2 VEGETATION

The cessation of crop cultivation should re-establish native wetland vegetation along with a corresponding decrease in bare ground. In addition, with a potential for an increase in surface water and longer hydroperiods, re-establishment and proliferation of wetland-dependent vegetation species may occur. Therefore, Project impacts may alter the vegetation community in a positive manner, with a potential increase in biodiversity and species richness.

Vegetation composition may change due to increased shading from solar arrays; however, this is considered an indirect and temporary impact (Northrup and Wittemyer 2011).

5.2.3 SOIL

Soils within the Project area lack the characteristics of water-altered soils. The Project area will not be graded and a cover crop will be seeded prior to construction and maintained until after construction, thereby reducing the risk of sedimentation and erosion of soils around wetlands.

5.2.4 WILDLIFE

Potential impacts to wildlife from solar energy development include habitat loss and fragmentation, loss of connectivity, alteration and degradation of wildlife habitat, and water use (Bird Life International 2017). Other reports have identified wildlife displacement and mortality as additional impacts from solar PV facility developments (RSPB 2014; Bird Life International 2017).

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Habitat loss and fragmentation can be the largest contributor to impacts resulting from the siting of the solar PV facility (Bird International 2017) and is an unavoidable result of solar developments. The loss and fragmentation of habitat can result in the displacement of some wildlife from areas around the facility, which could lead to altered species composition and behavior (Northrup and Wittemyer 2013). Specific to the proposed Project, this impact has been minimized through the placement of the facility on previously disturbed lands.

5.3 MINIMIZATION

Disruption to the natural flow of water into a wetland can result in changes to wetland vegetation, including altered biodiversity and species richness, death of surrounding vegetation, and the establishment of weedy and undesirable plant species. To mitigate these impacts and to avoid future changes to wetland vegetation from proposed construction activities, the terrain surrounding wetlands will be left as intact as possible to ensure adequate surface water flow into the wetlands following snow/ice melt and precipitation events. This will ensure hydrologic stability of these wetlands. Maintaining surface drainage into the wetlands will allow for re-establishment of native wetland vegetation species and promote biodiversity via an increase in species richness.

A cover crop (e.g., barley) will be used for dust control and maintained via mechanical mowing. Mowing should be done during late summer and fall when surface water is not present in the wetlands and when impacts to wildlife, such as breeding or migratory birds, will be minimal or entirely avoided. Solar Krafte will also consult with local farmers to develop site-appropriate noxious and prohibited noxious weed and agricultural pest control methods.

Potential impacts to the environment or wildlife will be minimized by construction timing, and by following the standards and best management practices outlined in the Spring Coulee Solar Project Wildlife Assessment Report (Basin 2017).

The following standard mitigation measures should be implemented at the Project area:

- A qualified environmental professional should be on-site during construction activities. The professional will provide instruction to the contracting crew to ensure regulatory compliance for working in/around waterbodies, including wetlands.
- A qualified environmental professional will recommend mitigations measures for sensitive wildlife, including, but not limited to, amphibians, if present at the time of construction. A qualified biologist should be on site to survey the construction area and relocate any amphibians to reduce the potential of injury to them during construction.

- All mitigation and regulatory requirements will be reviewed during the pre-job meeting, involving the appropriate personnel to ensure that all mitigation requirements are understood and can be implemented.

Table 6 details the measures that will be taken to minimize the indirect impacts to the wetland, where possible.

TABLE 6 MITIGATION MEASURES

Resource Feature	Mitigation Measures
Vegetation and Hydrology	<ul style="list-style-type: none"> • Perform construction during dry ground conditions, specifically when ephemeral and seasonal wetlands are dry (e.g., during late summer and fall months). • Minimize establishment of weed species by ensuring all equipment is cleaned prior to arriving on site. • Weeds will be controlled according to the <i>Alberta Weed Control Act</i> (Government of Alberta 2011). • Use native seed mixes, including wetland-dependent species, to revegetate any disturbed areas. • Avoid clearing or damage to vegetation within riparian areas of wetland, where possible and present. Equipment operators should not disturb or destroy vegetation outside of the Project area.
Soil and Hydrology	<ul style="list-style-type: none"> • Perform construction in a manner that minimizes soil compaction, rutting and sedimentation. This will include sediment and erosion control measures, including silt fencing, geotextiles and vegetated buffers, when and where required. • Install effective erosion and sediment control measures before starting work, to prevent sediments from entering waterbodies or wetlands • Regularly inspect and maintain erosion and sediment control measures and structures during the construction activities. • Repair erosion and sediment control measures and structures if damage occurs. • Remove non-biodegradable erosion and sediment control materials once site is stabilized. • Fuel and oil products will not be stored within 100 m of any wetland or waterbody. Spill mitigation measures will be in place at designated refueling areas located a minimum of 100 m from all wetlands and waterbodies.

Resource Feature	Mitigation Measures
	<ul style="list-style-type: none"> Activities should be halted during adverse construction conditions caused by heavy rains or other weather events.
Wildlife	<ul style="list-style-type: none"> Avoid impacts to migratory birds and their nests in accordance with the federal <i>Migratory Birds Convention Act</i> by avoiding wetland impacts during the restricted activity period of April 13 to August 24 (Environment and Climate Change Canada [ECCC] 2017). Should work proceed during this time, a nest search of the area will be undertaken by a qualified Professional Biologist. All listed wildlife species identified in the Alberta <i>Wildlife Act</i> (Government of Alberta 2012), <i>Migratory Bird Convention Act</i> (Government of Canada 1994), and the <i>Species at Risk Act</i> (Government of Canada 2014) will be conserved. A nest sweep is required prior to construction and is valid for 7 days. Additional sweeps will be required after 7 days to meet conditions of the <i>Migratory Birds Convention Act</i>.

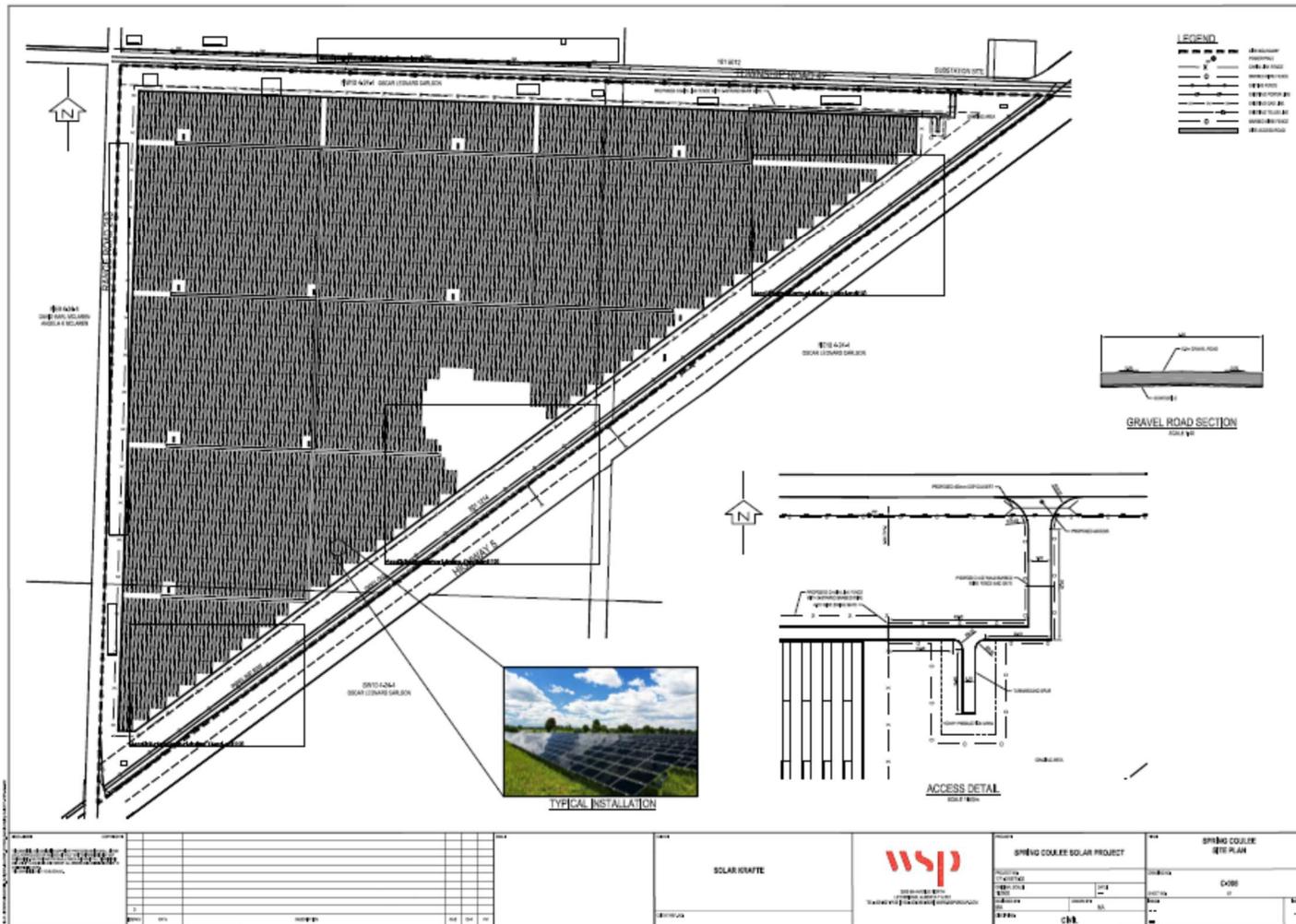


FIGURE 3 SPRING COULEE SOLAR PROJECT SITE PLAN

6.0 WETLAND REPLACEMENT PROPOSAL

The Alberta Wetland Mitigation Directive (Government of Alberta 2017e) states that wetlands must be replaced when impacts cannot be avoided; however, replacing wetlands with same functionality as those lost is difficult. Thus, the area replaced must be greater or equal than that lost to sufficiently compensate for loss in wetland complexity and function. As such, replacement ratios have been put in place to address the disparity between the restored and the lost wetland area. Impacted wetlands are assessed using the Alberta Wetland Rapid Assessment Tool-Actual (ABWRET-A). Utilizing this tool, wetlands are assigned a relative wetland value, which determines the appropriate ratio required to supplement (i.e., in-lieu fee) for their losses.

To fulfill the replacement obligation, Solar Krafte proposes to make a payment to a Wetland Replacement Agent via the in-lieu fee program. Table 7 summarizes the anticipated fee required for replacement of direct impacts of the three wetlands.

TABLE 7 SUMMARY OF WETLAND REPLACEMENT PROPOSAL

Wetland ID	ABWRET A Final Score	Anticipated Area of Wetland Permanently Lost due to Activity (ha)	Replacement Ratio	Relative Value Assessment Unit	In-lieu Rate (\$/ha)	Amount owed
Wetland 1	Ephemeral	0.00007	N/A	N/A	N/A	N/A
Wetland 2	Ephemeral	0.00008	N/A	N/A	N/A	N/A
Wetland 3	D	0.00027	1:1	21	\$17,700	\$4.78
Total		0.00042				\$4.78

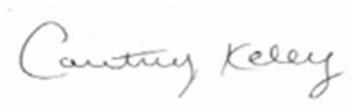
7.0 CLOSURE

If you have any questions or require additional details, please contact the undersigned.

Sincerely,

Basin Environmental Ltd.

Report Prepared by:

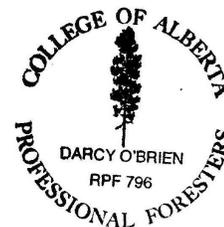
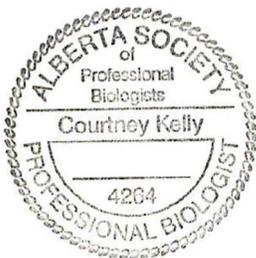


Courtney Kelly, B.Sc., P.Biol.
Biologist

Reviewed by:



Darcy O'Brien, B.Sc., RPF
Principal, Senior Project Manager



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APPENDIX A

RESULTS OF HISTORICAL AERIAL PHOTOGRAPH ASSESSMENT

TABLE 1 HISTORICAL AERIAL PHOTO ASSESSMENT FOR WETLAND 1

Wetland No.	Photo Date	Photo ID (roll)	Photo Number	Resolution	Season ¹	AWCS Class	Precipitation Year ²	Open Water Visible ³	Photo Notes	Assessment of Permanence
Wetland 1	November 11, 1961	AS874	159	1: 31,680	Fall	M-G-sb-I	N	DVI	Indistinguishable; snow present	N
Wetland 1	July 18, 1970	AS1055	155	1: 31,680	Summer	M-G-sb-I	N	DVI	Indistinguishable	N
Wetland 1	September 21, 1976	AS2998	267	1: 25,000	Fall	M-G-sb-I	N	DVI	Indistinguishable; Cultivated	N
Wetland 1	June 17, 1985	AS3197	265	1: 25,000	Spring	M-G-sb-I	W	DV	Indistinguishable; Cultivated	N
Wetland 1	September 21, 1987	AS3657	280	1:30,000	Fall	M-G-sb-I	N	DV	Dry; margins evident	N
Wetland 1	May 8, 1999	AS4955	17	1:30,000	Spring	M-G-sb-I	D	DVI	Indistinguishable; Cultivated	N
Wetland 1	June 30, 2012	DS2012-13	193	1:30,000	Spring	M-G-sb-I	D	W	Wet	N

Notes: 1 Spring = April to June; Summer = June to September; Fall = September to November
 2 D=Drier; N=Normal; W=Wet; N/A=Not available
 3 W=Water; D=Dry; DV= Dry vegetated; DVI= Dry, vegetated, indistinguishable

TABLE 2 HISTORICAL AERIAL PHOTOS ASSESSMENT FOR WETLAND 2

Wetland No.	Photo Date	Photo ID (roll)	Photo Number	Resolution	Season ¹	AWCS Class	Precipitation Year ²	Open Water Visible ³	Photo Notes	Assessment of Permanence
Wetland 2	November 11, 1961	AS874	159	1: 31,680	Fall	M-G-sb-I	N	DVI	Indistinguishable; snow present	N
Wetland 2	July 18, 1970	AS1055	155	1: 31,680	Summer	M-G-sb-I	N	DVI	Indistinguishable	N
Wetland 2	September 21, 1976	AS2998	267	1: 25,000	Fall	M-G-sb-I	N	DVI	Indistinguishable; Cultivated	N
Wetland 2	June 17, 1985	AS3197	265	1: 25,000	Spring	M-G-sb-I	W	DV	Indistinguishable; Cultivated	N
Wetland 2	September 21, 1987	AS3657	280	1:30,000	Fall	M-G-sb-I	N	DV	Dry; margins evident	N
Wetland 2	May 8, 1999	AS4955	17	1:30,000	Spring	M-G-sb-I	D	DVI	Indistinguishable; Cultivated	N
Wetland 2	June 30, 2012	DS2012-13	193	1:30,000	Spring	M-G-sb-I	D	W	Wet	N

Notes: 1 Spring = April to June; Summer = June to September; Fall = September to November
 2 D=Drier; N=Normal; W=Wet; N/A=Not available
 3 W=Water; D=Dry; DV= Dry vegetated; DVI= Dry, vegetated, indistinguishable

TABLE 3 HISTORICAL AERIAL PHOTOS ASSESSMENT FOR WETLAND 3.

Wetland No.	Photo Date	Photo ID (roll)	Photo Number	Resolution	Season ¹	AWCS Class	Precipitation Year ²	Open Water Visible ³	Photo Notes	Assessment of Permanence
Wetland 3	November 11, 1961	AS874	159	1: 31,680	Fall	M-G- sb-III	N	DVI	Indistinguishable; snow present	N
Wetland 3	July 18, 1970	AS1055	155	1: 31,680	Summer	M-G- sb-III	N	W	Partially wet; margins evident	N
Wetland 3	September 21, 1976	AS2998	267	1: 25,000	Fall	M-G- sb-III	N	W	Wetland evident; wet	N
Wetland 3	June 17, 1985	AS3197	265	1: 25,000	Spring	M-G- sb-III	W	DVI	Indistinguishable; Cultivated	N
Wetland 3	September 21, 1987	AS3657	280	1:30,000	Fall	M-G- sb-III	N	DV	Dry; margins evident	N
Wetland 3	May 8, 1999	AS4955	17	1:30,000	Spring	M-G- sb-III	D	W	Wetland evident; wet	N
Wetland 2	June 30, 2012	DS2012-13	193	1:30,000	Spring	M-G-sb-III	D	W	Partially wet; defined channel from inflow	N

Notes: 1 Spring = April to June; Summer = June to September; Fall = September to November
 2 D=Drier; N=Normal; W=Wet; N/A=Not available
 3 W=Water; D=Dry; DV= Dry vegetated; DVI= Dry, vegetated, indistinguishable

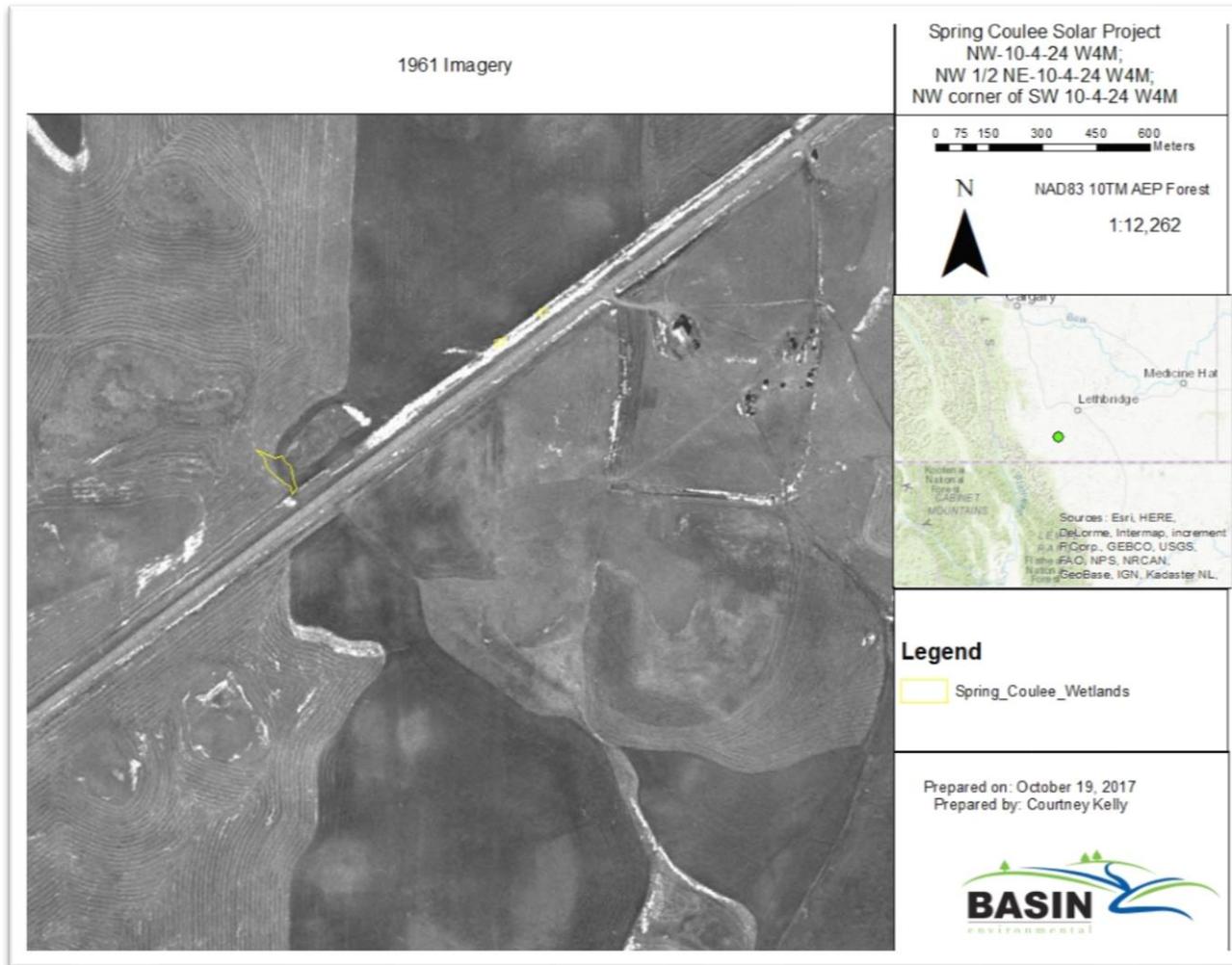


FIGURE 1 AERIAL PHOTO OF PROPOSED PROJECT AREA IN 1961



FIGURE 2 AERIAL PHOTO OF PROPOSED PROJECT AREA IN 1970



FIGURE 3 AERIAL PHOTO OF PROPOSED PROJECT AREA IN 1976

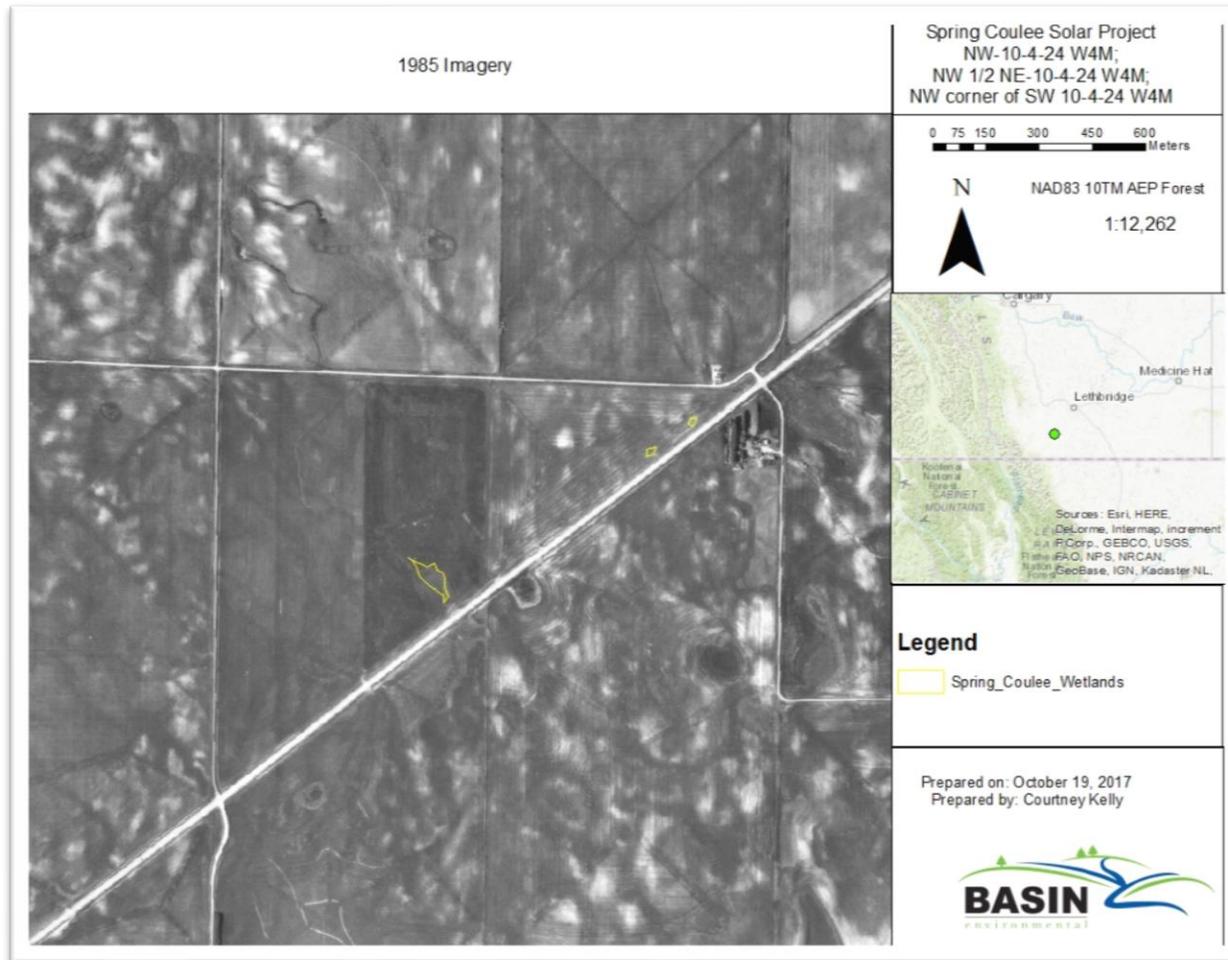


FIGURE 4 AERIAL PHOTO OF PROPOSED PROJECT AREA IN 1985

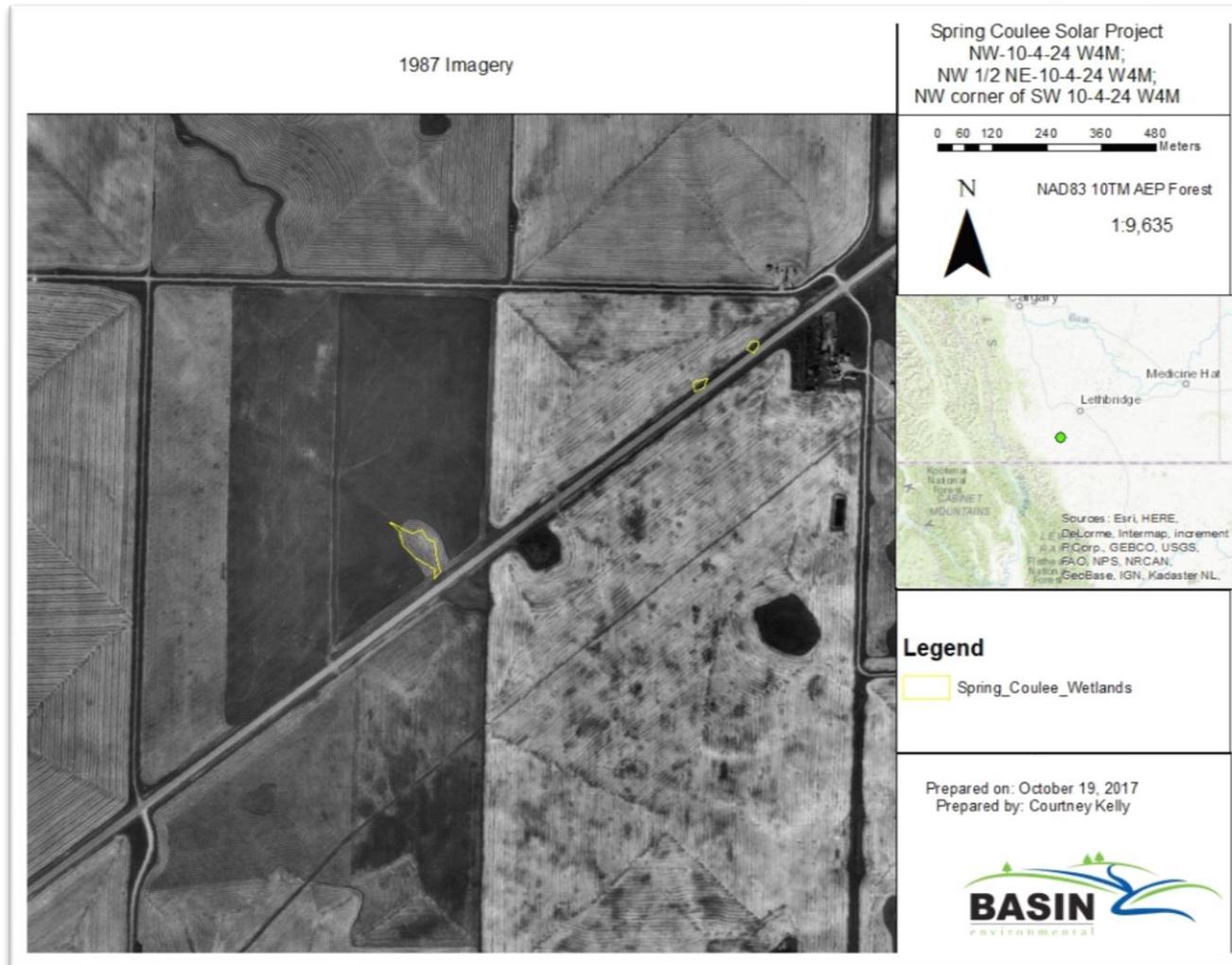


FIGURE 5 AERIAL PHOTO OF PROPOSED PROJECT AREA IN 1987.



FIGURE 6 AERIAL PHOTO OF PROPOSED PROJECT AREA IN 1999



FIGURE 7 AERIAL PHOTO OF PROPOSED PROJECT AREA IN 2012

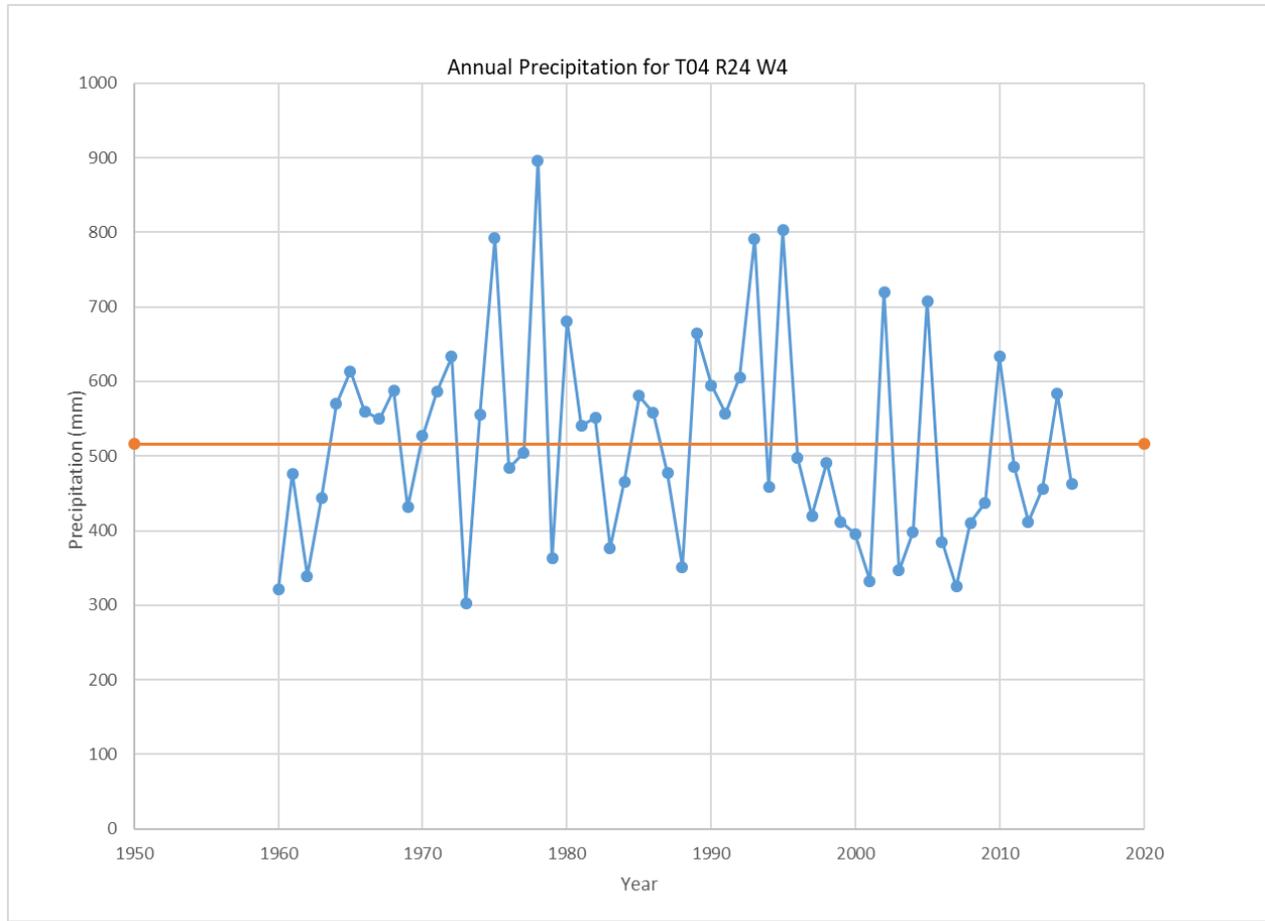


FIGURE 8 PRECIPITATION DATA FROM 1960 TO 2015 (ALBERTA AGRICULTURE 2017)

APPENDIX B

SITE PHOTOGRAPHS

WETLAND 1 AND 2

Date:
May 22, 2017

Direction:
Northeast

Description:
Rainfall event the night before photo. Partially cultivated and partially roadside ditch.

Wetland Classification:
M-G-sb-I



WETLAND 3

Date:
May 22, 2017

Direction:
Northwest

Description:
Wetland completely cultivated margins are difficult to distinguish. Rainfall event the night before picture

Wetland Classification:
M-G-sb-III



WETLAND 3

Date:
May 22, 2017

Direction:
South

Description:
Low topography where
water is channelized

Wetland Classification:
M-G-Sb-III



WETLAND 3 CULVERT

Date:
May 22, 2017

Direction:
South

Description:
Culvert providing surface
water inflow to Wetland3

Wetland Classification:
M-G-sb-III



APPENDIX C

DATABASE SEARCH RESULT

Additional Application Requirements			
Wildlife Survey	Yes	DND Area	
Sensitive Features			
Wildlife and Other Sensitive Species			
	Intersected		Intersected
Burrowing Owl Range		Piping Plover Waterbodies	
Caribou Range		Sensitive Amphibians Ranges	
Colonial Nesting Birds		Sensitive Raptor Range	Yes
Eastern Short-horned Lizard Range		Sensitive Snake Species Range	
Endangered and Threatened Plants Ranges		Sharp-tailed Grouse Leks and Buffer	
Greater Sage Grouse Range		Sharp-tailed Grouse Survey	Yes
Greater Sage Grouse Leks and Buffer		Special Access Zone	
Grizzly Bear Zone		Swift Fox Range	
Key Wildlife and Biodiversity Areas		Trumpeter Swan Buffer	
Mountain Goat and Sheep Areas		Trumpeter Swan Waterbodies/Watercourse	
Ord's Kangaroo Rat Range			
Other Sensitive and Endangered Species	Yes		
Federal Orders:			
	Intersected		
Greater Sage Grouse			
Grassland and Parkland Natural Region:			
	Intersected		
Grassland and Parkland Natural Region	Yes		

Fish and Wildlife Internet Mapping Tool (FWIMT)

(source database: Fish and Wildlife Management Information System (FWMIS))

Species Summary Report

Report Created: 13-Apr-2017 13:44

Species present within the current extent :

Fish Inventory

No Species Found in Search Extent

Wildlife Inventory

PRONGHORN

Stocked Inventory

No Species Found in Search Extent

Buffer Extent

Centroid (X,Y):
711522, 5539961

Projection
10-TM AEP Forest

Centroid:
(Qtr Sec Twp Rng Mer)
NW 10 4 24 4

Buffer Radius:
1 kilometers

Contact Information

For contact information, please visit:

<http://aep.alberta.ca/about-us/contact-us/fisheries-wildlife-management-area-contacts.aspx>

Please note that actual locations of FWMIS records were requested from AEP and these observations were also included in Table 2 of the report.

Search ACIMS Data

Date: 23/10/2017
Requestor: Consultant
Reason for Request: Environmental Reporting
SEC: 10 **TWP:** 024 **RGE:** 04 **MER:** 4



Non-sensitive EOs: 0 (Data Updated: July 2015)

M-RR-TTT-SS	EO_ID	ECODE	S_RANK	SNAME	SCOMNAME	LAST_OBS_D
-------------	-------	-------	--------	-------	----------	------------

No Non-sensitive EOs Found: Next Steps - [See FAQ](#)

Sensitive EOs: 0 (Data Updated: July 2015)

M-RR-TTT	EO_ID	ECODE	S_RANK	SNAME	SCOMNAME	LAST_OBS_D
----------	-------	-------	--------	-------	----------	------------

No Sensitive EOs Found: Next Steps - [See FAQ](#)

Protected Areas: 0 (Data Updated: May 2015)

M-RR-TTT-SS	PROTECTED AREA NAME	TYPE	IUCN
-------------	---------------------	------	------

No Protected Areas Found

Crown Reservations/Notations: 0 (Data Updated: May 2015)

M-RR-TTT-SS	NAME	TYPE
-------------	------	------

No Crown Reservations/Notations Found

Function (ABWRET-A Raw Score)	W3
Surface Water Storage (WS)	3.49
Stream Flow Support (SFS)	2.52
Streamwater Cooling (WC)	1.46
Sediment & Toxicant Retention & Stabilization (SR)	2.53
Phosphorus Retention (PR)	3.17
Nitrate Removal & Retention (NR)	4.82
Organic Nutrient Export (OE)	2.82
Fish Habitat (FH)	0.00
Aquatic Invertebrate Habitat (INV)	5.89
Amphibian Habitat (AM)	2.82
Waterbird Habitat (WB)	3.93
Songbird, Raptor, & Mammal Habitat (SBM)	2.73
Pollinator & Native Plant Habitat (PH)	3.09
Human Use & Recognition (HU)	1.40
Function (ABWRET-A Normalized Score)	W3
Surface Water Storage (WS)	0.38
Stream Flow Support (SFS)	0.41
Streamwater Cooling (WC)	0.21
Sediment & Toxicant Retention & Stabilization (SR)	0.04
Phosphorus Retention (PR)	0.17
Nitrate Removal & Retention (NR)	0.20
Organic Nutrient Export (OE)	0.43
Fish Habitat (FH)	0.00
Aquatic Invertebrate Habitat (INV)	0.61
Amphibian Habitat (AM)	0.36
Waterbird Habitat (WB)	0.25
Songbird, Raptor, & Mammal Habitat (SBM)	0.21
Pollinator & Native Plant Habitat (PH)	0.24
Human Use & Recognition (HU)	0.07
Normalized Score (ABWRET_A) Based on Wetlands in RWVAU	W3
Normalized Hydrological Health (HH)	0.41
Normalized Water Quality (WQ)	0.43
Normalized Ecological Health (EH)	0.61
Normalized Human Use (HU)	0.07
RWVAU #	21
Normalized Value Score (ABWRET_a)	0.44
Value Category (a, b, c, d)	d
Abundance Factor	1
Final Score(A, B, C, D)	D