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Introduction

Wind power is one of the fastest growing energy industries in the world. The Government of Alberta’s Climate Leadership Plan recognizes that the development of renewable energy will help reduce greenhouse gas emissions and air pollution, diversify energy supplies, stimulate regional activity, and fortify collaboration across industry sectors. The Climate Leadership Plan identifies the following goal:

“By 2030, renewable sources like wind and solar will account for up to 30% of electricity generation.”

The reduction in greenhouse gas emissions due to the use of wind power contributes to avoiding climate change impacts on habitats and wildlife. However, wind power can pose a potential threat to vulnerable habitats and species, particularly birds and bats (Erickson et al. 2001; Drewitt and Langston 2008; Baerwald and Barclay 2009). Wind energy projects must be appropriately sited, well-planned and well-operated to avoid or mitigate these effects. Standardized pre- and post-construction surveys of wildlife species and habitat characteristics are key components to inform wildlife mitigation of wind energy projects. The role of the Government of Alberta’s Ministry of Environment and Parks (Wildlife Management Unit- herein, AEP) is to ensure that the development of wind power projects includes appropriate consideration and mitigation of potential effects on Alberta’s wildlife populations.

This document summarizes potential wildlife issues associated with wind energy projects and provides a Directive for minimizing effects to wildlife and wildlife habitat during the siting, construction, and operation of wind energy projects. It is to be applied to all non-urban wind energy applications and renewals going forward from the date that this Directive is finalized and released by the AEP. It is designed to inform wind energy developers and the Alberta Utilities Commission (herein AUC) of potential wildlife issues and AEP expectations to avoid and minimize wildlife impacts. It is recognized that each project is unique and may require an adaptive approach; therefore, this document does not preclude alternative mitigative discussions between AEP Wildlife Biologists and the wind energy developers. AEP Wildlife Biologists are committed to provide meaningful feedback to stakeholders during any stage of the application process to ensure projects meet the intent of this Directive. Additionally, the Directive serves to assist AEP Wildlife Biologist staff in advising wind energy developers,

responding to stakeholder inquiries related to regulatory applications, and providing consistent responses to wind energy applications submitted to the AUC.

As our understanding of the effects of wind energy projects on Alberta's wildlife improves, so too will our ability to manage these effects. The Directive will be reviewed at least once every ten years; however, this review period does not assign an expiry date to the information contained within, nor does it preclude amendments from being proposed and adopted over time as new information becomes available. The AEP Wildlife Biologist is committed to consulting with industry, government, and other stakeholders as part of this review process. To access the most current version of this document, search for "Wildlife Directive for Wind Energy Projects" on:

- <http://www.aep.alberta.ca>

Scope and Application

Issues surrounding wind energy projects are multi-faceted and extend well beyond wildlife matters. The scope of this Directive, however, will be limited to those issues affecting wildlife and wildlife habitat that arise from the development and operation of wind energy projects in Alberta. This Directive will apply to all of Alberta, wherever wind energy projects are proposed and require AUC or other regulatory approval.

Recommendations from AEP Wildlife Biologists are based on the legislative authority of the Alberta *Wildlife Act* and are designed to protect wildlife (including species at risk) and wildlife habitat from the potential impacts of wind power development and operation. Under AUC Rule 007 the application requirements for power plants, substations, transmission lines, industrial system designations and hydro developments are outlined. As part of the regulatory process, the AUC requests of the proponent to ensure that environmental (including wildlife) concerns are addressed in the application. This Directive will assist industry in planning, constructing, and operating wind energy projects in such a way to mitigate harmful effects on wildlife and wildlife habitat. The wildlife outcomes expected from implementing this Directive are described in Appendix C.

- [AUC Rule 007](#)

Proponents applying for wind energy developments are responsible for understanding and complying with other federal, provincial and municipal requirements that may affect their proposed wind energy project(s). For example, in addition to protection under the provincial *Wildlife Act* many species of birds are also protected by the federal government under the *Migratory Birds Convention Act*.

Wildlife species requiring special management are described as "Species at Risk"; referring primarily to species that have been provincially (Alberta - *Wildlife Act*) or federally (Canada - *Species at Risk Act* (SARA)) listed as Endangered, Threatened, or of Special Concern. The term may also be used to describe some species identified as "May Be at Risk" or "Sensitive" through the Alberta General Status evaluation (search for 'General Status' on <http://www.aep.alberta.ca>). The *Accord for the Protection of Species at Risk* outlines the joint responsibilities of the federal and provincial governments for species at risk.

This document addresses all Alberta wildlife, regardless of whether they fall under federal or provincial jurisdiction or occur on privately-owned or Crown land. However, for species under federal jurisdiction that are on provincial lands, or for all wildlife on federal lands, there are additional federal government department requirements. It is the responsibility of the applicant to determine the nature of any additional federal requirements, and to ensure that these requirements are met. These can be identified by contacting Natural Resources Canada (NRCan), which is the federal government agency responsible for wind power development on federal lands such as National Parks and Military Reserves.

In addition to the potential impacts to wildlife and wildlife habitat from the wind turbines and substations, the potential for wildlife to be impacted by non-turbine wind energy production-associated infrastructure, such as accompanying power lines, collection lines and roads, also exists. This Directive applies to wind turbines, substations, and associated non-turbine infrastructure (e.g., roads, fences, collection lines, power lines, etc.) within the area defined by the wind energy project boundary and included in the application to the AUC. The above described scope is referred to in this Directive as the “wind energy project”.

If an expansion of the scope of this Directive is necessary at a future time, it will be amended to reflect that decision.

Wildlife Issues Related to Wind Energy Projects

Wildlife-related issues associated with wind energy projects in Alberta can be categorized as follows:

1. **Direct mortality** resulting from flying in proximity to, or collisions with wind turbines and associated infrastructure (e.g., power lines). Modern turbines operate at 11-28 rotations per minute (rpm) and have blade tip speeds approaching 220-290 kilometres per hour (American Wind Wildlife Institute 2014). Birds may be unable to recognize blade presence at rotor tips (the “smear effect”) at high blade speed (United States Fish and Wildlife Service 2012). Mortality is increased for nocturnal bird species by the installation of non-flashing/steady burning lights on wind turbines and buildings, which may serve as attractants (Gehring et al. 2009). The likelihood of mortality for birds of prey (hawks, owls, eagles, and falcons) and bats may be influenced by changes in prey populations (small mammals, insects, and proximity to fish bearing lakes or streams) near the wind energy project. The highest bat mortalities occur during the late summer or early fall migration period, either through direct collision with blades or indirectly by rapid decompression (barotrauma) near turbines (Baerwald 2008). Turbine height and the number of turbines may also play a significant role in bat fatalities (Baerwald and Barclay 2009).

Many collisions with wind energy infrastructure by birds occur during spring and fall migration or during aerial displays around the nest (Erickson, et al. 2001; Nicholson 2005; Erickson 2014). The risk of collision appears to vary between family groups. Raptors, for example, often fly at altitudes within the rotor-swept area (Kingsley and Whittam 2003) and appear to be at a higher risk of collision with wind turbines than other family groups (National Wind Coordinating Committee 2010). While a bird or bat of any species may collide with a wind turbine, concerns are primarily with the following species/species groups in Alberta:

- Migrating and resident bats
 - Raptors
 - Grassland birds
 - Greater sage-grouse and sharp-tailed grouse
 - Migrating songbirds
 - Shorebirds
2. **Habitat loss, degradation, and fragmentation** result from the development of wind turbines and associated non-turbine infrastructure, including roads, power lines, collection lines, etc.. This may include the loss or fragmentation of important native habitats for wildlife and Endangered or Threatened plants or vulnerable plant communities. Effects on native plant communities through introduction and spread of invasive plants along roads and on exposed topsoil at construction sites may also occur. Further, there is an inability to re-create some unique vegetation community types (e.g. rough fescue grasslands) post-disturbance resulting in permanent habitat loss, which can negatively impact wildlife and wildlife habitat.

- 3. Disturbance** caused by infrastructure and increased human activity at wind energy projects and/or by the movements of rotor blades, may result in decreased productivity and wildlife avoidance of the area (Kingsley and Whittam 2003; Manville 2004; Barber 2009; Patricelli 2013). A study in Minnesota found that grassland birds occurred in reduced densities within 100 meters of turbines (Leddy et al. 1999). Recent research has indicated that avoidance of wind energy facilities by species of grassland birds can fragment populations, increasing threats to at-risk populations (Kingsley and Whittam 2003; Pruett et al. 2009a; Pruett et al. 2009b). One of the most critically endangered birds in Alberta, the greater sage-grouse, experiences reduced nest and brood survival near wind energy projects (Lebeau et al. 2014). Herons and other colonial water birds do not appear to be particularly susceptible to collisions with turbines, but there is potential for disturbance at their nesting colonies if turbines are located in close proximity (within 1000 m) to the colonies (Kingsley and Whittam 2003, Environment Canada 2006).

Limited research has been conducted on the effects of wind turbines on other wildlife such as ungulates, amphibians and invertebrates; however, a great deal of research exists on the effects of other industrial disturbances (e.g., construction, vehicles, human use) on these species. Precautionary mitigation measures (i.e., maintaining amphibian setback distances) will be employed for these wildlife species.

The Approach

This document is designed to help proponents identify sources of risk to wildlife from various phases of wind energy developments (e.g., planning, construction and operation). It provides information to proponents and regulators on methods to avoid, and if avoidance is not possible, to effectively mitigate, these activities in order to mitigate the risk to wildlife and wildlife habitat. Organization of this document follows a staged approach, whereby the sequential stages allow the proponent to proceed logically along a risk assessment pathway to evaluate and avoid or mitigate the effects of wind energy projects on wildlife populations. This approach is consistent with that of other North American jurisdictions, notably the United States Fish and Wildlife Service (USFWS) Wind Power Guidelines (United States Fish and Wildlife Service 2012).

Each stage outlines standards or recommendations to avoid or mitigate the risk of a proposed wind energy project on wildlife and wildlife habitat. Requirements of this Directive, as opposed to recommendations, are clearly separated as either:

1. Standards - provide siting, timing and site-related wildlife conservation requirements that must be met in the planning and development of a wind energy facility. All standards are preceded by “100”.
2. Best Management Practices (BMPs) - are practices that may assist in the planning and locating of activities. BMPs are designed to inform the proponent of desired practices while planning and operating in Alberta. BMPs are provided for information and consideration in the planning of wind energy facilities to support better conservation and protection of wildlife and wildlife habitat. All BMPs are preceded by “200”.

Under Rule 007 of the AUC application process, there is a requirement to demonstrate that environmental (including wildlife) concerns are addressed. In the case of an emergency situation, Standards listed in this Directive may be exempt during the emergency period.

It is the responsibility of the proponent to ensure that the Directives are followed.

Stage 1: Site Selection

Siting projects to avoid important wildlife habitats may significantly reduce the need for further mitigation measures. In the context of the landscape, “site selection” is the general location of a wind energy project. Appropriate site selection is the first and most critical factor in preventing significant negative effects on wildlife (Drewitt and Langston 2008). The AEP Wildlife Biologist expects wind energy proponents to minimize the effects of their project on wildlife and wildlife habitat at this stage. Once a site is proposed, pre-construction wildlife surveys, timing of construction and infrastructure design can be used to address site or species-specific risks (Stages 2-4).

100.1 Standards

- 100.1.1. Wind turbines, wind energy infrastructure, and temporary work spaces must be sited to avoid or minimize their occurrence in important wildlife habitats or areas that attract or funnel birds or bats (Baerwald 2008; Alberta Sustainable Resource Development 2010). For example, without limiting the generality of the foregoing, such areas include native grasslands, old growth forest stands, mapped Wildlife Sensitivity Layers, named water bodies, valley breaks (including coulees), valleys of large permanent watercourses and the eastern slopes region.
- 100.1.2. Further to 100.1.1, wind energy projects must not be established in the following Wildlife Zones*:
- Greater Sage-Grouse Range (inclusive of the area covered by Environment Canada’s Emergency Protection Order)
 - Trumpeter Swan Waterbodies and Watercourses (inclusive of 800 m setback** from waterbody and watercourse)
 - Caribou Zones
 - Mountain Goat and Sheep Zones
 - Piping Plover Waterbodies (inclusive of 200 m setback from waterbody)
- 100.1.3. Wind energy projects must be appropriately sited to avoid or minimize their occurrence in the following mapped Wildlife Zones:
- Special Access Zones
 - Key Wildlife and Biodiversity Zones
 - Grizzly Bear Zones
- 100.1.4. No new access development can occur in the Grizzly Bear Zones that currently exceed the open road thresholds as defined by the Alberta Grizzly Bear Recovery Plan as amended (can be found on <http://www.alberta.ca> by searching “Grizzly Bear Recovery Plan”).

* Wildlife Sensitivity Layers/Zones include habitat and features that have been mapped into specific ranges and zones; current versions can be accessed by searching “Wildlife Sensitivity Layers” on <http://www.aep.alberta.ca>. These wildlife layers/zones have been developed by AEP to provide industrial operators, government departments, and the general public with the best information currently available on the extent of wildlife sensitivities.

** Note that within this document, a turbine setback distance is measured as the distance from the closest edge of the rotor swept area to the closest edge of the feature. For all other features (e.g., raptor nests) a setback is measured from the edge of the feature to the edge of the project footprint.

Stage 2: Turbine Location; Pre-Planning And Surveys

At this stage, an appropriate location has been selected and consideration regarding individual turbine siting, planning and surveys begins. Project proponents must conduct the pre-construction wildlife and plant (vegetation) surveys that cover the project area plus any potential setbacks. Surveys are to be designed, conducted and supervised by experienced wildlife biologists (see Glossary) and appropriate environmental professionals. Where AEP survey protocols are not defined, it is expected that all surveys will be in accordance with the best available scientifically acceptable practices as outlined in the Sensitive Species Inventory Guidelines (Government of Alberta, 2013c). Surveys must be designed based on local and migratory wildlife species assemblages, habitats, area topography, and project design. Pre-construction planning and surveys provide a baseline, as well as identify potential risks to wildlife (Kingsley and Whittam 2003).

100.2 Standards

- 100.2.1 To determine the possible occurrence of species at risk or sensitive plants and animals in the proposed project area, proponents must examine the available wildlife data from the AEP for the project area plus a 1 km buffer zone at a minimum around wind energy project footprint. Data sources include the Fish and Wildlife Management Information System (FWMIS), Wildlife Sensitivity Data Sets (i.e., key range layers and key wildlife layers), Landscape Analysis Tool (LAT), Alberta Conservation Information Management System (ACIMS; for occurrences of rare plant species), and available habitat identification tools where available (e.g., Habitat Suitability Index (HSI) tools, Resource Selection Function (RSF) modeling tools, or risk mapping tools etc.). Proponents can request a search of the FWMIS database by searching “FWMIS” on <http://www.aep.alberta.ca/>.
- 100.2.2. Proponents must conduct the surveys as per 100.2.1 in a manner appropriate for the detection of potentially affected species in the proposed project area plus buffer zone. Survey protocols must follow the GOA *Sensitive Species Inventory Guidelines*. If AEP survey protocols are not defined, surveys must be done with the best available scientifically acceptable practices. Local AEP Wildlife Biologists must be consulted to discuss additional surveys that may be required, but do not have guidelines published in the *Sensitive Species Inventory Guidelines* (i.e., grizzly bear den surveys). For acoustic bat detection, the timing specified below must be followed. To obtain these documents search “wildlife survey methods” on <http://www.aep.alberta.ca/>.

The following surveys are required, at a minimum, for all wind energy project applications:

- Spring and fall migration surveys for songbirds, raptors and waterfowl/waterbirds. The range of the migration season (early to late migrations) will be considered for these avian groups when designing surveys.
- Raptor nest searches within the 1 km setback are required[†].
- Breeding bird surveys (two surveys): early species (May 1 to June 15) and late species (June 16 to July 15).
- Acoustic bat surveys (two surveys): spring migration (May 1 to 31) and summer/fall migration (July 15 to October 15). Additional surveys may be required dependent on the presence of hibernacula and other features.

[†] Raptor searches are required throughout the province of Alberta; however, the type of raptor survey differs between grassland/parkland regions and Boreal/Montane/Alpine/Canadian Shield regions. Refer to the *Sensitive Species Inventory Protocols* for more information.

- Conduct field investigations to determine the presence and extent of native grasslands and other important natural habitats (e.g., wetlands, riparian habitats) (Bradley & Neville 2011; ANPC 2012).

Surveys, in addition to what is listed above, are required to be conducted specifically for the sensitive or otherwise identified wildlife if the proposed project area and buffer zone occur within the following Key Range or Wildlife Layers (Search for ‘Wildlife Sensitivity Maps’ on <http://www.aep.alberta.ca/>):

- Burrowing Owl Range
- Eastern Short-horned Lizard Range
- Endangered and Threatened Plants Ranges
- Ord’s Kangaroo Rat Range
- Sensitive Snake Species Range
- Sharp-tailed Grouse
- Swift Fox Range
- Colonial Nesting Birds (within 1000 m of point data)
- Grizzly Bear Core and Secondary Zones

100.2.3. All wildlife surveys required by this Directive must be conducted for a minimum of one year and must be considered current until the project is commissioned (refer to Standard 100.2.4).

100.2.4. The proponent must ensure that the following surveys are kept current between inssuing of an AEP-Wildlife Referral Report and construction of the project:

- Burrowing owl
- Sensitive raptors
- Sharp-tailed grouse
- Swift fox
- Ord’s kangaroo rat
- Grizzly bear den surveys

Surveys are considered current within two years of the last survey date.

100.2.5. The required setbacks and timing restrictions must be adhered to for all wildlife and habitat features detected by the surveys within the wind project area and buffer zone. Wind energy projects must follow all setbacks described in Appendix A.

100.2.6. In addition to 100.2.5, no wind energy project may occur within 100 m from the top of a valley break (including coulees).

100.2.7. In addition to 100.2.5, no wind energy project may occur within 100 m from any wetland class (bog, fen, marsh, shallow open water, swamp) identified in Table 1 in the Alberta Wetland Classification System (Government of Alberta 2015) except for wetland classes with Water Permanence listed as Temporary in this Table.

100.2.8. Wind energy project infrastructure and associated activities must not occur within 1000 m of a named lake as per NRCAN (2015).

- 100.2.9. Wind turbines and associated infrastructure must not be constructed within the identified setback of a species at risk or sensitive species as described in Appendix A.
- 100.2.10. Projects for which construction has not begun within 5 years of completion of wildlife surveys will need to repeat surveys to ensure accuracy of information. This may include all initial wildlife surveys over and above those listed in 100.2.4. Discussions with the AEP Wildlife Biologist will need to be re-initiated to account for the delay in project development and will require repeating wildlife surveys.
- 100.2.11. Turbines must be located in a manner that does not obstruct bird movement and should be at least 200m apart as per Kingsley and Whittam (2003). The proponent must demonstrate how turbine array orientation was selected to minimize the risk of wildlife mortality.
- 100.2.12. A comprehensive report must be submitted that details: methods, results, interpretation of results, and bat mortality estimates compared to the *Bat Mitigation Framework for Wind Power Development* (Government of Alberta 2013a). Following the completion of surveys, data collected must be submitted to the AEP Wildlife Biologist in the appropriate format for entry into FWMIS (and to ACIMS for plants).

200.2 Best Management Practices

- 200.2.1 The proponent should minimize tower height of wind turbines to reduce risk of wildlife mortalities (Baerwald 2008; Baerwald and Barclay 2009; United States Fish and Wildlife Service 2012).
- 200.2.2 The proponent should avoid ephemeral waterbodies and temporary marshes as defined by the Alberta Wetlands Classification System (Government of Alberta 2013b, Government of Alberta 2015).
- 200.2.3 Any mature, poplar (dead or living) of 34 cm diameter at breast height or greater should be maintained in the proposed project area and buffer zone, regardless of whether a nest has been located in the tree (Alberta Environment and Parks 2016).
- 200.2.4 To minimize loss and fragmentation of native habitats, proponents should use existing disturbed areas for installation and staging of wind energy project infrastructure. Integrated Land Management (ILM) principles must be considered in all applications (to access this information, search ‘Integrated Land Management’ on <http://www.aep.alberta.ca/>).
- 200.2.5 Wind energy project activities should be located adjacent to existing operations, existing access, or within anthropogenic clearings to minimize the spatial extent of cumulative disturbance, as well as to minimize the need for associated access.
- 200.2.6 New land disturbances for wind energy projects should avoid complex, multi-story, mature mixed wood forest. Young, single-species stands of trees should be selected as the alternative site for the disturbance if one exists nearby.

Stage 3: Construction And Operation Mitigation

It is important to reduce the potential effects of turbine construction and operation of the wind energy project on wildlife. Wind energy companies and wildlife consultants must develop construction and operational mitigation plans that meet with the expectations outlined by this Directive. Site- and species- specific construction mitigation plans will be developed for each wind energy project. Wind energy developers are expected to incorporate mitigation plans into the design of all wind turbine installations. Areas of temporary disturbance, including those occurring outside of the site footprint (i.e., turbine lay down areas) must be included in construction stage mitigation plans. Construction and operation mitigation techniques are described below.

100.3 Standards

- 100.3.1 The proponent must submit a construction and operation mitigation plan that complies with this Directive. Operations include all operational activities, including maintenance.
- 100.3.2 The proponent must sequence construction activities to avoid sensitive periods for wildlife, such as the breeding season. Without limiting the generality of the foregoing, on native grasslands, construction activities must occur outside of April 1st to July 15th (grassland bird breeding season). They must also comply with Species at Risk and Sensitive species timing restrictions (Alberta Sustainable Resource Development 2010).
- 100.3.3 If operating within a Key Wildlife and Biodiversity Zones, wind energy project construction activities must not occur during the identified periods in the following areas:
- a) For all areas North of Highway #1, no activity is permitted between January 15th and April 30th.
 - b) South of Highway #1 and west of Highway #2, no activity is permitted between December 15th and April 30th.
- 100.3.4 All construction activities associated with a wind energy project must minimize habitat disturbance and fragmentation through use of matting, reduced soil stripping, frozen construction, minimize fencing and reduced road grades, and other available minimum disturbance techniques (Appendix B) (Drewitt and Langston 2008).
- 100.3.5 Where vehicular access is required to be developed to, or within, a wind energy project that is located within Grizzly Bear Zones, Key Wildlife and Biodiversity Zones or Special Access Zones, the use of temporary access roads (Class IV, V, and VI) is required. Temporary roads must be closed to the public to prevent unauthorized access and reclaimed immediately after construction.
- 100.3.6 If upgraded vehicular access is required to be developed within a wind energy project that is located within Key Wildlife and Biodiversity Zone and Special Access Zone, the proponent must ensure maintenance of existing road-side vegetation to eliminate line-of-sight into clearings. Road-side vegetation is not required if line-of-sight from the road is limited to a maximum of 200 m using opening size, topography, residual structure, and other similar measures.
- 100.3.7 All newly constructed roads in Grizzly Bear Zones must run perpendicular to creeks or rivers, wherever possible. These roads must also be designed as dead-end and should not loop through the Grizzly Bear Zones.
- 100.3.8 When a wind energy project is located in forested areas, including Grizzly Bear, Key Wildlife and Biodiversity and Special Access Zones, line-of-sight must be limited to 200 m on non-roadway linear disturbance features (cross-country). New linear disturbances that intersect existing roadways must

incorporate techniques that reduce the line-of-sight from the existing roadway. Techniques include using live vegetation, doglegs, and boring.

- 100.3.9 Access control and access management must be implemented for all wind energy projects within Grizzly Bear Zones, Key Wildlife and Biodiversity Zones and Special Access Zones (Appendix D).
- 100.3.10 For new access roads within the Grizzly Bear Zones, construction of the roads associated with the wind energy project must maintain treed buffers (at least 10 m wide) along roads that parallel cleared areas or as informed by Foothills Research Institute's sightability tool (see: <http://www.friresearch.ca>).
- 100.3.11 Permanent infrastructure for wind energy projects within Grizzly Bear Zones, exclusive of turbines, must be constructed within 100 m of existing arterial all-weather permanent access roads. Turbines should be constructed within 100 m of existing arterial all-weather permanent access roads whenever possible.
- 100.3.12 Any watercourse crossings must comply the *Government of Alberta Code of Practice for Watercourse Crossing* (Government of Alberta 2013d).
- 100.3.13 Tubular turbine towers, rather than lattice towers, must be used for a wind energy project to minimize bird perching and nesting opportunities (Drewitt and Langston 2008).
- 100.3.14 Wind energy projects must avoid using guy wires on permanent communication or meteorological towers (Nicholson 2005, Dickey 2012). Where avoidance is not possible, the guy wires must be equipped with markers specifically designed to reduce the potential for bird collisions (e.g., see markers at <http://www.powerlinesentry.com>).
- 100.3.15 Wind energy project collection lines must be placed underground using minimal disturbance construction techniques unless there are significant landscape constraints (Bradley and Neville 2011). Where aboveground power lines are required due to landscape constraints, these lines must be designed and constructed to avoid collision and electrocution of birds. The AEP Wildlife Biologist expects wind energy developers to comply with the suggested practices developed by the Avian Power Line Interaction Committee (APLIC 2006; APLIC 2012).
- 100.3.16 In situations where construction at a wind energy project poses an elevated risk to native wildlife, a qualified and experienced wildlife biologist (see Glossary) must be on site to monitor wildlife behaviour during construction and to propose and implement on site mitigation actions.
- 100.3.17 Legumes shall not be seeded for re-vegetation of any linear disturbance associated with wind energy projects located within Grizzly Bear Zones.

200.3 Best Management Practices

- 200.3.1 Proponents should minimize the need for operational personnel on-site during the restricted wildlife time periods (Kingsley and Whittam 2003).
- 200.3.2 Proponents should manage construction activities to prevent and control the spread of invasive species. AEP Wildlife Biologists require wind energy developers to comply with the *Weed Control Act*.
- 200.3.3 Impacts to wildlife and wildlife habitat from lights should be minimized. Lighting for on-ground infrastructure must be reduced, down-shielded, and controlled by proximity sensors wherever possible.

- 200.3.4 Proponents must design the wind energy project sites to minimize new linear access. Coordinated access and industrial development strategies, which integrate the sequencing (time and space) of construction activities, should be used to minimize human footprint. The amount of cumulative clearing can be minimized through an integrated review of planned disturbance between all land users. Proponents should contact other companies operating in the area to coordinate and integrate planned linear disturbance.
- 200.3.5 All wind energy project workers operating in grizzly bear areas should be provided with “Bear Awareness Training”.
- 200.3.6 All wind energy projects work sites (see Glossary) located in bear areas must manage attractants.
- 200.3.7 All wind energy project activities shall implement strategies to minimize risk of human and bear conflicts around camps and facilities, as identified through the Alberta BearSmart information (search ‘Alberta BearSmart’ on <http://www.aep.alberta.ca>).
- 200.3.8 Operations should be planned to avoid high quality and/or effective grizzly bear habitat.
- 200.3.9 The area required for all components of the wind energy project should be as small as practical.
- 200.3.10 The design and construction of a wind energy project and associated infrastructure including all linear disturbances should avoid crossings of permanent watercourses as much as possible.
- 200.3.11 Proponents should minimize the number of linear disturbances by using a shared corridor for utility services, roads, and other linear features, where managed all-weather access is required.
- 200.3.12 Once no longer used for the wind energy project, the inactive portion(s) of the access road that is within 100 m of a public road(s) shall be closed to vehicle traffic within one year of non-use. Plans for deactivating or decommissioning of roads must be included in the project plan.
- 200.3.13 If construction activities on native grassland habitats are unavoidable and have suitable justification accepted by the AEP Wildlife Biologist, the following guidelines are to be used – *Principals for Minimizing Surface Disturbance in Native Grasslands* (search for “native grassland disturbance” on <http://www.alberta.ca>) (Government of Alberta 2016).

Stage 4: Post-Construction Wildlife Monitoring And Adaptive Management

Post-construction monitoring is intended to assess the effectiveness of mitigation efforts and identify any ongoing wildlife risks through carcass surveys and wildlife monitoring. Monitoring determines whether additional or modified operational mitigation options are required. Adaptive management is an iterative learning process producing better understanding and improved management over time (Kerlinger et al. 2010) and will be implemented for all wind energy projects.

Site characteristics and results of pre-planning surveys will determine the duration and level of effort for post-construction surveys. Regardless, the AEP Wildlife Biologist requires a post-construction monitoring program to be carried out for a minimum of three years at all wind energy sites in the province to identify effects on wildlife.

100.4 Standards

- 100.4.1 The proponent will conduct post-construction monitoring surveys annually, for a minimum of three years, after the wind energy project is operational.
- 100.4.2 The post construction monitoring surveys must be site specific and adhere to a monitoring protocol that complies with this directive.
- 100.4.3 The post construction monitoring surveys required by 100.4.1 must:
- document bat and bird mortality around specific wind turbines,
 - determine carcass removal rate by scavengers or other means,
 - determine searcher efficiency in detecting carcasses of birds or bats, and
 - monitor impacts of the wind energy project on species at risk, sensitive species or other wildlife.
- 100.4.4 Post-construction site specific monitoring protocols developed for each wind energy project must define survey area, extent, frequency, seasonality, and duration:
- Survey area: Surveys must be completed around the entire turbine in an area at least half the maximum height of the turbine (measured from tip of blade to the ground) or a radius of 50m, whichever is larger (New Brunswick Department of Natural Resources 2011).
 - Extent: A minimum of 20 turbines or one-third of the turbines, whichever is the larger number, must be monitored for post-construction wildlife mortality. The turbines should be selected through a stratified random sample, to allow representation of all habitat types within the wind energy project boundary. The selected turbines must include a mix of footprint edge turbines and internal turbines. The same turbines must be sampled in subsequent years to evaluate temporal trends.
 - Frequency: Surveys must be conducted weekly at each turbine site selected for monitoring.
 - Seasonality: Surveys must be conducted March 1st - October 30th.
 - Duration: Post-construction wildlife monitoring must be completed for a full three years. Additional survey years may be required if post-construction mitigation is required or if additional wildlife data are needed.

In order to compare pre-construction survey results and post-construction survey results, monitoring must include all or a portion of the pre-construction surveys (refer to Standard 100.2.2). Post-construction monitoring surveys must follow the bat monitoring techniques and protocol; however, the surveys must remain consistent with Standard 100.4.2. The recommendations on post-construction monitoring protocols for bats can be found on <http://www.aep.alberta.ca> by searching for 'Bat Post Construction'.

- 100.4.5 Wildlife Research and Collection permits must be obtained by the proponent to conduct the post-construction monitoring because permits are required for wildlife research activities and projects that involve handling of dead wildlife in Alberta. For more information on research permits, search “wildlife research” on <http://www.aep.alberta.ca>.
- 100.4.6 The post-construction monitoring is to be conducted by an experienced wildlife biologist (see Glossary) who has experience conducting surveys for the species in question.
- 100.4.7 Proponents shall promptly notify the local AEP Wildlife Biologist of species at risk mortality or high levels of mortality, as defined by the AEP using the Bat Mitigation Framework, or other related tools (search “Bat Mitigation Framework” on <http://www.aep.alberta.ca>).
- 100.4.8 At a minimum, an annual report must be submitted by the date specified in the post-construction monitoring plan.
- 100.4.9 When conducting any post-construction monitoring survey, the proponent shall collect, identify, label, freeze and submit the carcasses of species at risk and sensitive species to AEP-Wildlife Lab (attn.: Wildlife Disease Specialist, O. S. Longman Building, Seventh Floor, 6909 - 116 Street, Edmonton, Alberta, T6H 4P2). Other or excess carcasses that are not required for searcher efficiency trials must also be sent to the AEP-Wildlife Lab.
- 100.4.10 The post-construction annual report in 100.4.8 shall include the following:
- a detailed description of the survey methods,
 - the raw data, using the appropriate FWMIS datasheet for each turbine (found on <http://www.alberta.ca> and search for “FWMIS”),
 - results of searcher efficiency trials and scavenger removal trials,
 - the uncorrected fatality rate for bats and birds expressed as the number of mortalities/turbine/year and mortalities/megawatt/year[‡],
 - the corrected rates of mortalities/turbine/year and mortalities/megawatt/year as per Huso (2011) or acceptable alternative[§],
 - a summary of species killed,
 - results of pre-construction wildlife surveys (i.e., breeding bird survey, raptor nest monitoring, etc.),
 - a comparison of the pre- and post-construction survey results (e.g., breeding bird, raptor nest monitoring, etc.),
 - a comparison of the estimated fatality rates from pre-construction surveys and the fatality rates from post-construction surveys for birds and bats, and
 - a statement of compliance with the Directives and the signature of the lead biologist.
- 100.4.11 Where the results of any post-construction monitoring survey demonstrates wildlife mortalities exceed acceptable levels, operational mitigation measures as described in the post-construction mitigation plan, must be implemented to reduce the risk of future fatalities. Operational mitigation options to reduce or prevent wildlife fatalities include: altering cut-in speed, feathering of turbine blades, seasonal shutdown, or other acceptable industrial practices.

[‡] The uncorrected mortality rate may be used if assessing the risk of mortality at an individual turbine site.

[§] GOA will use the corrected mortality rate to assess risk of mortality to birds and bats.

- 100.4.12 When post-construction mitigation actions are required to be employed by this Directive the proponent must conduct additional two years of post-construction monitoring surveys following their implementation to assess their success^{**}. If initial mitigation does not sufficiently reduce mortality, further mitigation and post-construction monitoring surveys will be required.
- 100.4.13 Upon receipt of a written request from the AEP-Wildlife Biologist, proponents will allow access and ensure that private land owners are aware and consent to visits to the site by AEP-Wildlife Biologist or associated researcher(s).

^{**} This can be included as part of Standard 100.4.1. For example, if mitigation occurs after the first year of surveys, the total survey time will be three years, but if it occurs after the second year of post-construction surveys, the total survey time will be four years.

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Glossary

Access Plans - Management plan that provides a framework for managing motorized and non-motorized travel in the planning area and is developed with participation from concerned government agencies, local authorities and the public.

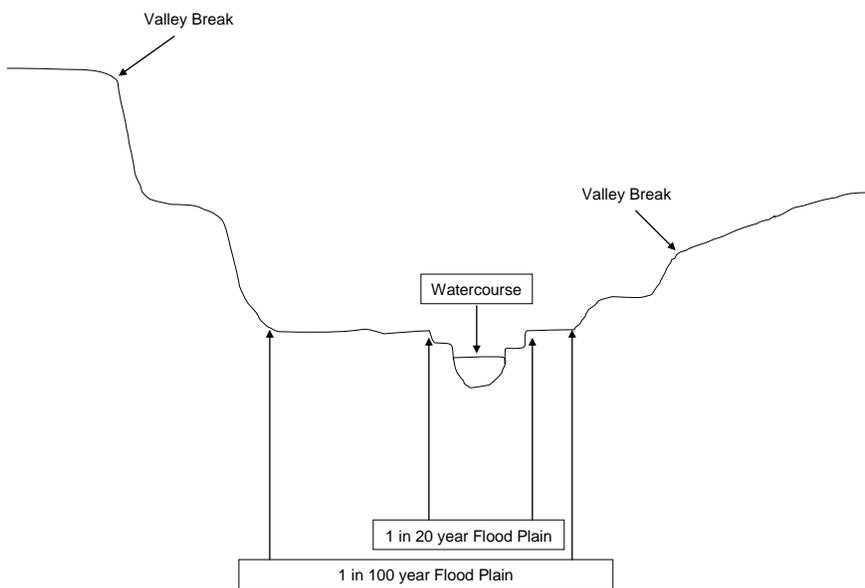
Active House, Nest, or Den - An active house, nest, or den is one that is presently being used by wildlife as confirmed through the visual presence of an animal, or the evidence of fresh feces, signs of digging/excavation, feathers, and/or tracks.

Activities - All wind energy project operations on the landscape, including planning, construction, operation, maintenance and decommissioning.

Agronomic Species - A non-native plant developed for use agricultural use as a crop or forage.

At Risk - As defined in the Status of Alberta Wild Species, any species known to be 'At Risk' after formal detailed status assessment and legal designation as 'Endangered' or 'Threatened' in Alberta.

Break (valleys) - The point where change in slope of the ground demarks uplands from the fluvial hills dropping into a valley bottom, which includes watercourses and coulees (see diagram below).



Buffer - An area of vegetation maintained around a feature (distance applied to all sides of feature) to mitigate the effects of any activity applied to the area beyond the buffer.

Burrowing Owl Nest (Active) - A residence for two full years after the last known month of occupation.

Coulee - A dry stream valley, especially a long steep-sided ravine that once carried melt water from a glacier.

Commission - A project state after construction is complete, when all wind energy infrastructure is in place and ready to produce electricity.

Construction - When surface soil is mechanically disturbed for the purpose of creating or erecting wind energy infrastructure.

Critical Habitat - As defined by Canada's *Species at Risk Act*; **critical habitat** is the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or in an action plan for the species.

Cut-in Speed - The minimum wind speed at which the turbine blades overcome friction and begin to rotate.

Disturbance - Any alteration of the natural landscape by anthropogenic or natural processes.

Endangered^{††} - As defined by the Alberta *Wildlife Act*, a wildlife species facing imminent extirpation or extinction.

Emergency Situation - Emergency means an event that requires prompt co-ordination of action or special regulation of persons or property to protect the safety, health or welfare of people or to limit damage to property.

Experienced Wildlife Biologist - AEP-Wildlife Biologists expect that all wildlife surveys are completed by experienced biologists. All wildlife surveyors working in Alberta must have:

- a. The ability to positively identify target species by sight and/or sound. Multiple years of wildlife and surveying experience is preferred.
- b. Familiarity with the species biology, including habitat requirements of the species and experience in identifying the species habitat features.
- c. Familiarity with survey methods as described in the *Sensitive Species Inventory Guidelines*. Multiple years of experience is strongly recommended.
- d. Attained a Bachelor of Sciences degree in Biology, Environmental Sciences, Renewable Resources, or hold a Technical Diploma in Natural Resources or Environmental Management from a certified College.

Feathering of Blades - Refers to turning the angle of the blades of a turbine into or out of the wind to control production or absorption of power.

Fescue Grasslands - The native grassland communities associated with the dark brown and black chernozemic soils of Alberta that are primarily located within the Foothills Fescue, Northern Fescue, Central Parkland, Foothills Parkland, Montane and Subalpine Natural Subregions. The specific plant communities are described in the Range Plant Community Guides published on the AEP website: <http://aep.alberta.ca/lands-forests/grazing-range-management/range-plant-community-guides-stocking-rates.aspx>.

Footprint - The surface area of land disturbed from its natural condition by human activity and the associated impact to or on related natural resources.

Fragmentation - The breaking up of contiguous blocks of habitat into increasingly smaller blocks as a result of direct loss and/or sensory disturbance (i.e., habitat alienation) (Alberta Environment 2010).

Frozen Construction/Frozen Access - Operations that occur when the ground is frozen. Conditions dependant on local weather, rather than specific dates.

^{††} The federal *Species at Risk Act* has similar designations to the Alberta *Wildlife Act*, however the individual designations afforded to a species may differ between the two pieces of legislation. It is the responsibility of the proponent to ensure they are compliant with any federal legislation.

Hibernacula - Shelter used by a hibernating animal or group of animals (i.e. snakes, bats) during the winter months.

High Suitability Habitat - Areas with high potential for species occurrence.

Infrastructure - Any and all equipment, structures and roads that are developed for a wind energy project.

Integrated Land Management (ILM) - The strategic planned approach to managing and reducing human-caused footprint.

Land Capability - The ability of land (unaltered by future management inputs, activities, or alterations) to support a given land use, based on an evaluation of the physical, chemical and biological characteristics of the land, including topography, drainage, hydrology, soils and vegetation.

Lek - Traditional place where males (grouse) assemble during the mating season and engage in competitive displays to attract females.

Line-of-Sight - A straight unobstructed path in treed areas, between an observer and an object (typically wildlife or industry structure). Dog-legs, buffers or angled ROWs reduce the line-of-sight and screen visibility from the road.

May Be At Risk - As defined in the Status of Alberta Wild Species, any species that 'May Be at Risk' of extinction or extirpation, and is therefore a candidate for detailed risk assessment.

Native Grasslands - An area of prairie in which natural vegetation consists primarily of perennial grasses. The native species composition must be greater than 30% (Adams et al. 2005).

Native Habitat - The natural environment of an organism, consisting of vegetation native to the local area.

Native Species - Wildlife and plant species that are indigenous to a particular region.

Noxious Weeds - Plants listed in the *Alberta Weed Control Act*, *Weed Control Regulation*, or designated by a local municipal authority.

Rangeland - Rangeland, or range, is land supporting indigenous or introduced vegetation that is either grazed or has the potential to be grazed and is managed as a natural ecosystem. Rangeland includes: grassland, grazeable forestland, shrubland, pastureland, riparian areas.

Reservation - An identification code (e.g. Protective [PNT], Consultative [CNT]) placed on public land to identify features worthy of special consideration when industrial or other operations are contemplated.

Right-of-Way (ROW) - A cleared area, usually linear, containing a road and its associated features, such as shoulders, ditches, cut and fill slopes, or the area cleared for the passage of utility corridors, containing collection lines or over- or under-ground pipelines. Typically, the right-of-way is a specially designated area of land having very specific rights of usage attached.

Riparian - The adjoining vegetated uplands that are directly influenced by the waterbody.

Rookery - Birthing location and nursery of a wildlife species including, but not limited to, snakes, herons, or crows.

Seasonal Shutdown - Termination or suspension of operations for a period of time annually.

Sensitive Raptor Active Nest - A raptor nest will retain 'active' designation during the winter following nesting activity, through a second year, and into a third year, with the 'active' designation being dropped on June 1 of the

second year of inactivity. If no other nesting structures (trees, platforms) are available within a 1 kilometre radius of the nest, the nest will retain 'active' designation at the discretion of an AEP Wildlife Biologist.

Sensitive Species - Any species that is not at risk of extinction or extirpation, but may require special attention or protection to prevent it from becoming at risk.

Sensory Disturbance - Impacts to and disturbances from noise, light, odour associated with human activities.

Setback Distance - The interval distance between a wildlife site to the edge of industrial infrastructure. For wind turbines, setback distance is measured from the closest edge of the rotor swept area to the closest edge of the feature.

Species at Risk^{††} - Any species identified by the Alberta *Wildlife Act* as 'Endangered', 'Threatened' or 'Species of Special Concern', or has been identified under Alberta's General Status process as 'At Risk', 'May Be at Risk' or 'Sensitive'.

Substation - An auxiliary power station where electrical current is converted.

Tame Pasture - Rangelands that have been modified and seeded to agronomic forage species such as Timothy, creeping red fescue, smooth brome grass and, in some cases, legumes such as alsike clover, orchard grass, crested wheatgrass, meadow brome and alfalfa.

Temporary Work Space - The use of existing clearings or the new clearing of public or private land to facilitate the construction of a disposition or operation.

Threatened^{§§} - As defined by The Alberta *Wildlife Act*, a wildlife species likely to become 'Endangered' if limiting factors are not reversed.

Waterbody - Any location where water is present, whether or not the presence of water is continuous, intermittent or occurs only during a flood, and includes but is not limited to wetlands and aquifers.

Watercourse - A river, brook, stream or other natural water channel (includes ephemeral draws), and the bed along which water flows.

Watercourse (Intermittent) - Small stream channels, mainly sourced from small springs during periods outside of spring runoff and heavy rainfall. They have distinct channel development, usually with no terrestrial vegetation and a width less than 0.4 metres. These watercourses usually have some bank development.

Watercourse (Small Permanent) - Permanent streams that often have small valley bottoms and bench floodplain development. Banks and channel are well defined with a width from greater than 0.7 metres to 5 metres.

Watercourse (Large Permanent) - Major streams or rivers with well-defined flood plains and usually a wide valley bottom. The channel is usually non-vegetated and exceeds 5 metres in width.

Wetland - Land having water at, near, or above the land surface, or which is saturated with water long enough to promote wetland or aquatic processes as indicated by poorly drained hydric soils, hydrophytic vegetation, and various kinds of biological activity that are adapted to the wet environment.

^{††} The federal *Species at Risk Act* has similar designations to the Alberta *Wildlife Act*, however the individual designations afforded to a species may differ between the two pieces of legislation. It is the responsibility of the proponent to ensure they are compliant with any federal legislation.

Wildlife - All wild species including plants, invertebrates, and micro-organisms, as well as fishes, amphibians, reptiles, and the birds and mammals that are traditionally regarded as wildlife.

Wildlife Habitat - The terrestrial and aquatic environments and associated ecosystem elements that in combination provide the requirements of food, cover and space needed to support self-sustaining populations of wildlife.

Wildlife Corridors - The physical linkage connecting two areas of habitat and differing from the habitat on either side. Corridors are used by organisms to move around without having to leave the preferred habitat. A linear habitat patch through which a species must travel to reach habitat more suitable for reproduction and other life sustaining needs. Many corridors, linking several patches of habitat, form a network of habitats. The functional effectiveness of corridors depends on the type of species, the type of movement, the strength of the edge effects and the corridor shape.

Wind Energy Infrastructure - All man-made components required to operate a wind energy project, including roads, turbines, substations, collection lines, etc..

Wind Energy Project - Inclusive term for the entire area of the wind energy project, including turbines, collection lines, roads, laydown areas and the substation.

Wildlife Survey - A comprehensive survey for all species and habitat features, as identified in the Landscape Analysis Tool, near the proposed area of a development, as defined by the protocols outlined in the *Sensitive Species Inventory Guidelines*.

Wildlife Sweep - A search of the immediate area of proposed development for key wildlife features, including nests and dens.

Wind Turbine - A turbine powered by wind for the purpose of generating electricity for commercial consumption.

Ungulate - A hoofed mammal.

Appendix A: Wildlife Setbacks and Timing Restrictions

Required setbacks and timing restrictions for wildlife and wildlife habitat detected at wind energy projects in Alberta. For turbines, setbacks are measured from the closest edge of the rotor swept area to the closest edge of the wildlife feature. For all other infrastructure (roads, feeder lines, etc.), setbacks are measured from the edge of the disturbance to the edge of the wildlife feature. For all species not specified below, the setback is 100 m from an active house, nest or den.

Species	Habitat Feature	Time of Year	Setback Distances for Wind Turbines and Infrastructure	Comments
Great Plains toad, plains spadefoot toad, northern leopard frog, boreal toad, Canadian toad, Columbian spotted frog	breeding ponds	year round	100 m	This applies to any wetland class (bog, fen, marsh, shallow open water, swamp) identified in Table 1 in the Alberta Wetland Classification System (Government of Alberta 2015) except for wetland classes with Water Permanence listed as Temporary in this Table.
long-toed salamander	breeding ponds	year round	100 m	
wandering garter snake, plains garter snake, red-sided garter snake	hibernacula	year round	500 m	
bullsnake, western hognose snake, prairie rattlesnake	hibernacula	year round	500 m	Construction & upgrades of roads are of concern within habitat proximate to river valleys inhabited by snakes.
	birthing rookeries	year round	200m	Additional to den setback to the extent necessary.
short-horned lizard	suitable habitat	year round	200m	Requires pre-development surveys in areas of suitable habitat.
peregrine falcon, prairie falcon	nest site	year round	1000m	
ferruginous hawk, bald eagle, golden eagle	nest site	year round	1000m	
osprey	nesting sites	year round	750m	

Species	Habitat Feature	Time of Year	Setback Distances for Wind Turbines and Infrastructure	Comments
northern goshawk	nesting sites	year round	500m	
barred owl	nesting sites	year round	500m	
burrowing owl	dens	year round	500m	
long-billed curlew, upland sandpiper, mountain plover, short-eared owl, chestnut-collared longspur, Sprague's pipit	active nest	Apr 1 - Jul 15	100m	
sharp-tailed grouse	lek	year round	500m	No human activity within setback from 1 hour before sunrise to 2 hours after sunrise (March 15- June 15) Maintain shrub cover within 1000 m of leks.
American white pelican	nesting colonies	year round	1000m	
great blue heron	nesting colonies	year round	1000m	
loggerhead shrike	nesting sites	Apr 1 - Jul 15	150m	
pileated woodpecker	nesting sites	year round	100m	
pied-billed grebe, horned grebe	nesting sites	Apr 15-Jul 31	1000m	
western grebe	nesting sites	year round	1000m	
Forster's tern	nesting sites	year round	1000m	
black tern	nesting sites	year round	1000m	
Ord's kangaroo rat	den	year round	250m	Larger setbacks may be recommended, especially in the high activity category (e.g., 500-1000 m), for large, high-impact projects, including graded roads.

Species	Habitat Feature	Time of Year	Setback Distances for Wind Turbines and Infrastructure	Comments
swift fox	den	year round	500m	
northern myotis	roost sites and hibernacula	year round	300m	
grizzly bear	den sites	Oct 1- Apr 31	750m	
tiny cryptanthe, whitebark pine, limber pine, western spiderwort, small-flowered sand verbena, hare-footed locoweed, slender mouse-eared cress, soapweed (yucca)	populations	year round	300m	

Appendix B: Right of Way Width Allowances

Class	Right of Way Width	Description
Class I	30 – 40 m	<ul style="list-style-type: none"> All weather access. Primary corridor.
Class II	20 – 30 m with variable allowance for terrain conditions	<ul style="list-style-type: none"> All weather or dry weather access.
Class III	<p>< 20 m with variable allowance for terrain conditions</p> <p>15 m where terrain or other conditions allow</p>	<ul style="list-style-type: none"> All weather or dry weather access. Site specific cuts and fills may be required. Right of way (ROW) width shall be the minimum required to allow travel, while addressing environmental concerns.
Class IV	<p>< 15m with variable allowance for terrain conditions</p> <p>Up to 20 m where required for watercourse approaches (to enable water management), log decks (every 800 m), corners, side slopes, and pull outs; all not to exceed 20% of the length of the route</p>	<ul style="list-style-type: none"> Low Grade, frozen or dry conditions. Can be constructed and used year round when conditions are suitable. Should a portion of the route become impassable due to wet conditions, drainage problems, or rutting, site specific improvements (i.e. matting, padding, culverts etc.) to the problematic area(s) may be implemented. Some access improvements required to support specific site servicing work shall be temporary only and removed after the activity is over. ROW width shall be the minimum required to allow travel, while addressing environmental concerns. Roads will typically follow contours of the landscape more closely than do higher standard routes. Drainage control and borrow material may be required on a site-specific basis. Cuts and fills shall be minimized.
Class V	<p>10m with variable allowance for terrain conditions</p> <p>Up to 20m where required for watercourse approaches (to enable water management), log decks (every 800 m), corners, side slopes, and pull outs;</p>	<ul style="list-style-type: none"> Minimal disturbance – frozen or equivalent to frozen. Allows for winter operations and/or emulates frozen ground access when frost conditions are not adequate or not present. Access will minimize ground disturbance under non-frozen ground conditions, and will mimic frozen ground access. Ground disturbance, surface vegetation disturbance, grade development, ROW clearing and surface improvements will be minimized. Can be constructed and used year round; during unfavourable ground conditions cessation of use or mitigation measures are required. Road width will be minimized wherever possible by sharing space with pipeline ROWs, seismic lines and through the use of vehicle

Class	Right of Way Width	Description
	all not to exceed 20% of the length of the route	<p data-bbox="643 216 743 243">pullouts.</p> <ul data-bbox="597 258 1455 489" style="list-style-type: none"> <li data-bbox="597 258 1455 384">• Route construction may not be feasible for all terrain conditions. A combination of padding, geo-textile, matting, road culverts, corduroy or other drivable surfaces may be required during non-frozen ground conditions. <li data-bbox="597 405 1455 489">• Gravel may be used in site-specific situations for safety or environmental protection of water crossings, but its use shall be minimal.
Class VI (Prairie and Parkland)	< 15m, with variable allowance for terrain conditions	<ul data-bbox="597 510 1455 907" style="list-style-type: none"> <li data-bbox="597 510 1455 546">• Minimal disturbance – dry or frozen ground. <li data-bbox="597 556 1455 651">• Ground disturbance, surface vegetation disturbance, grade development, ROW clearing and surface improvements shall be minimized. No grading shall occur. <li data-bbox="597 661 1455 756">• Can be constructed and used year round; during unfavourable ground conditions cessation of use or mitigation measures are required. <li data-bbox="597 766 1455 829">• May require adjustments to access schedules, and require use of alternative vehicles for site monitoring. <li data-bbox="597 840 1455 907">• Road width shall be minimized, wherever possible, by sharing space with pipeline ROWs, or other existing linear disturbances.

Appendix C: Wildlife Outcomes

Wildlife Outcomes: Describe the outcomes that are being strived for through the implementation of the avoidance and mitigation strategies identified in this Directive for various wildlife species and their associated habitat.

- A. Reduce human caused wildlife mortality.
- B. Reduce increased predation associated with anthropogenic features.
- C. Conserve and protect Critical Habitat.
- D. Maintain the ecological conditions necessary for naturally sustainable wildlife populations to exist throughout Alberta, and conserve the habitat that they require.
 - a) Maintain unique and/or important wildlife habitat sites.
 - b) Avoid or minimize development within key habitats (local and landscape scales) and key seasons.
 - c) Maintain habitat intactness, connectivity, and allow for wildlife use, breeding and passage throughout areas by minimizing habitat loss and fragmentation.
- E. Minimize potential adverse effects of land use activities on wildlife population health.
- F. Reduce the potential for species avoidance of anthropogenic features.
- G. Decrease potential for sensory disturbance and displacement of wildlife.
- H. Limit potential for human-wildlife conflict.

Appendix D: Access Control

1. Access control techniques are intended to restrict unauthorized access of vehicles. Where access control is required, the control measures identified below shall be effective, maintained, and monitored. Control measures may include one or more of the following:
 - earthen berms
 - permanent or temporary removal of water crossing structures
 - barricades
 - locked gates
 - manned checkpoints
 - road security patrols
 - treed buffers
 - reforestation
 - de-compaction
 - roll-back
 - pre-existing access control

The proponent will select an appropriate access control method to limit both highway and off-highway vehicles from accessing the site.

2. Signage should accompany all access control measures. Sign must be located at a visible spot at least 1.5 metres off the ground and not be obscured by plowed snow or vegetation.
3. When gates are used for access control, the following conditions shall apply:
 - a. Locked gates shall be constructed at locations and in a manner which will contribute to their effectiveness in preventing access to the road (in combination with applying public access restrictions).
 - b. Gates shall remain closed and locked at all times. The gate may only be opened to allow for the passage of an authorized vehicle.
 - c. Locks shall be placed in a structure that is designed to protect them from being broken.
 - d. As locks are lost or destroyed, they will be replaced within 72 hours of the disposition holder being aware of the need.
 - e. Gates will be designed to ensure that passage of a 4x4 on-highway vehicle is restricted. This may include the use of barrier rock, berms, ditches, placement of the gate before a bridge or other impediments to travel around the gate. All gates will be installed in such a manner that a safety hazard is not created.
 - f. Use of combination locks is required. Where this is not possible and keyed locks are used, double locking using a regulatory body lock is required. (Double locking refers to a company lock and a regulatory body lock on the same gate, allowing each party to pass using their own keys).
 - g. Disposition Holders will only make combination lock changes with prior confirmation from the issuing regulatory body staff in charge.

Original signed by: Travis Ripley Date: Jan 27, 2017

Executive Director

Fish and Wildlife Policy, Policy and Planning Division

Environment and Parks