APPENDIX O

Upper Great Plains Programmatic Environmental Impact Statement
Best Management Practices

Appendix O. Upper Great Plains Programmatic Environmental Impact Statement Best Management Practices

Generalized Topic	UGP PEIS BMPs*
Land use and public facilities	**General:** Plan and site the wind energy development to minimize impacts on other land uses. Consult with federal, state, and county agencies; Tribes; property owners; and other stakeholders as early as possible in the planning process to identify potentially significant land use conflicts and issues and state and local rules that govern wind energy development. • Avoid locating wind energy developments in areas of unique or important recreation, wildlife, or visual resources. When feasible, a wind energy development should be sited on already altered landscapes. • Consolidate infrastructure wherever possible to maximize efficient use of the land and minimize impacts. Existing transmission and market access should be evaluated, and use of existing facilities should be maximized. • Develop restoration plans to ensure that all temporary use areas are restored. **Agricultural and Grazing Lands:** Construction activities should be coordinated with landowners to minimize interference with farming or livestock operations. Issues that would need to be addressed could include installation of gates and cattle guards where access roads cross existing fence lines, access control, signing of open range areas, traffic management (e.g., vehicle speed management), and location of livestock water sources. • Construction debris should be removed from the site. • Excess concrete (excluding belowground portions of decommissioned turbine foundations intentionally left in place) should not be buried or left in active agricultural areas. • Vehicles should be washed outside of active agricultural areas to minimize the possibility of the spread of noxious weeds. • Topsoil should be stripped from any agricultural area used for traffic or vehicle parking—segregating topsoil from excavated rock and subsoil—and replaced during restoration activities. • Drainage problems caused by construction should be corrected to prevent damage to agricultural fields. • Following completion of construction and during decommissioning, subsoil should be decompacted (Brower 2005). **Recreation:** Ensure that adequate safety measures (e.g., access control and traffic management) are established for recreational visitors to adjacent properties. **Wetland and Grassland Easements:** Coordinate closely with the USFWS or U.S. Department of Agriculture during initial project planning to ensure that wetland and grassland easements are avoided to the extent practicable. **Military Operations:** Consult with the Department of Defense (DoD) during initial project planning to evaluate the potential impact of a proposed development on military airspace in order to identify and address any DoD concerns. **Aviation Operations:** Prepare the FAA-required notice of proposed construction during initial project planning in order to identify any air safety issues and required mitigation measures. Radar Interference. Mitigation measures pertaining to radar interference are provided in Section 3.8.2.4 of the UGP PEIS. The only way to completely avoid any adverse impacts on radar involves methods that avoid locating turbines in the radar line of sight (e.g., achieved by distance, terrain masking, or terrain relief) (DoD 2006). An additional solution could be to replace aging radar equipment with modern and flexible equipment that can better distinguish wind farm clutter from aircraft or weather (Brenner 2008). Turbine operations could also be curtailed during significant weather events. WAPA generally advises developers submitting interconnection requests to avoid areas that would potentially conflict with radar facilities. **Transportation:** Existing roads should be used to the extent possible, but only in safe and environmentally sound locations. If new access roads are necessary, they should be designed and constructed to the appropriate standard necessary to accommodate their intended function (e.g., traffic volume and weight of vehicles) and minimize erosion. Access roads that are no longer needed should be recontoured and revegetated. A transportation plan should be prepared that identifies measures the developer will implement to comply with state or federal requirements and to obtain the necessary permits. This will typically address the transport of turbine components, main assembly crane, and other large pieces of equipment. The plan should consider specific object size, weight, origin, destination, and unique handling requirements and should evaluate alternative means of transportation (e.g., rail or barge). A traffic management plan should be prepared for the site access roads to ensure that no hazards would result from increased truck traffic and that traffic flow would not be adversely impacted. This plan should identify measures that will be implemented to comply with any state or federal department of

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	transportation requirements, such as informational signs, flaggers when equipment may result in blocked throughways, and traffic cones to identify any necessary changes in temporary lane configurations. Signs should be placed along roads to identify speed limits, travel restrictions, and other standard traffic control information. To minimize impacts on local communities, consideration should be given to limiting construction vehicles on public roadways during the morning and late afternoon commute times. Project personnel and contractors should be instructed and required to adhere to speed limits commensurate with road types, traffic volumes, vehicle types, and site-specific conditions to ensure safe and efficient traffic flow. During construction, O&M, and decommissioning phases, traffic should be restricted to designated project roads. Use of other unimproved roads should be restricted to emergency situations.
Soil resources	• Avoid placement of wind energy facilities in areas with unsuitable seismic, liquefaction, slope, subsidence, settling, and flooding conditions. • Minimize the extent of the project footprint, including improved roads and construction staging areas. • Minimize ground-disturbing activities, especially during the rainy season. • Use existing roads and disturbed areas to the extent possible. • Site new roads to follow natural land contours; excessive slopes should be avoided. • Site new roads to avoid stream crossings and wetlands and minimize the need to cross drainage bottoms. • Surface new roads with aggregate materials, wherever appropriate. • Restrict heavy vehicles and equipment to improved roads to the extent practicable. • Control vehicle and equipment speed on unpaved surfaces. • Conduct construction and maintenance activities when the ground is frozen or when soils are dry and native vegetation is dormant. • Stabilize disturbed areas that are not actively under construction using methods such as erosion matting or soil aggregation, as site conditions warrant. • Salvage topsoil from all excavation and construction activities to reapply to disturbed areas once construction is completed. • Dispose of excess excavation materials in approved areas to control erosion. • Isolate excavation areas (and soil piles) from surface water bodies using silt fencing, bales, or other accepted appropriate methods to prevent sediment transport by surface runoff. • Use earth dikes, swales, and lined ditches to divert local runoff around the work site. • Reestablish the original grade and drainage pattern to the extent practicable. • Reseed disturbed areas with a native seed mix and revegetate disturbed areas immediately following construction.
Water resources	• Minimize the extent of land disturbance to the extent possible. • Use existing roads and disturbed areas to the extent possible. • Site new roads to avoid crossing streams and wetlands and minimize the number of drainage bottom crossings. • Apply standard erosion control BMPs to all construction activities and disturbed areas (e.g., sediment traps, water barriers, erosion control matting) as applicable to minimize erosion and protect water quality. • Apply erosion controls relative to possible soil erosion from vehicular traffic. • Identify and avoid unstable slopes and local factors that can cause slope instability (groundwater conditions, precipitation, seismic activity, high slope angles, and certain geological landforms). • Identify areas of groundwater recharge and discharge and evaluate their potential relationship with surface water bodies and groundwater quality. • Avoid creating hydrologic conduits between two aquifers (e.g., upper and lower). • Construct drainage ditches only where necessary; use appropriate structures at culvert outlets to prevent erosion. • Avoid altering existing drainage systems, especially in sensitive areas such as erodible soils or steep slopes. • Clean and maintain catch basins, drainage ditches, and culverts regularly.

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	• Limit herbicide and pesticide use to nonpersistent, immobile compounds and apply them using a properly licensed applicator in accordance with label requirements. • Dispose of excess excavation materials in approved areas to control erosion and minimize leaching of hazardous materials. • Reestablish the original grade and drainage pattern to the extent practicable. • Reseed (non-cropland) disturbed areas with a native seed mix and revegetate disturbed areas immediately following construction. • When decommissioning sites, ensure that any wells are properly filled and capped.
Air quality	**General:** General mitigation measures applicable to multiple phases of project development include the following: • Use surface access roads, on-site roads, and parking lots with aggregates or that maintain compacted soil conditions to reduce dust generation. • Post and enforce lower speed limits on dirt and gravel access roads to minimize airborne fugitive dust. • Minimize potential environmental impacts from the use of dust palliatives by taking the necessary measures to keep the chemicals out of sensitive terrestrial habitats and streams. The application of dust palliatives must comply with federal, state, and local laws and regulations. • Ensure that all pieces of heavy equipment meet emission standards specified in the state code of regulations, and conduct routine preventive maintenance, including tune-ups to manufacturer specification to ensure efficient combustion and minimum emissions. If possible, equipment with more stringent emission controls should be leased or purchased. • Employ fuel diesel engines in facility construction and maintenance that use ultra-low sulfur diesel, with a maximum 15 ppm sulfur content. • Limit idling of diesel equipment to no more than 10 minutes unless necessary for proper operation. **Construction:** Mitigation measures applicable during construction activities include the following: • Stage construction activities to limit the area of disturbed soils exposed at any particular time. • Water unpaved roads, disturbed areas (e.g., scraping, excavation, backfilling, grading, and compacting), and loose materials generated during project activities as necessary to minimize fugitive dust generation. • Install wind fences around disturbed areas if windborne dust is likely to impact sensitive areas beyond the site boundaries (e.g., nearby residences). • Spray stockpiles of soils with water, cover with tarpaulins, and/or treat with appropriate dust suppressants, especially when high wind or storm conditions are likely. Vegetative plantings may also be used to limit dust generation for stockpiles that will be inactive for relatively long periods. • Train workers to comply with speed limits, use good engineering practices, minimize the drop height of excavated materials, and minimize disturbed areas. • Cover vehicles transporting loose materials when traveling on public roads and keep loads sufficiently wet and below the freeboard of the truck to minimize wind dispersal. • Inspect and clean tires of construction-related vehicles, as necessary, so they are free of dirt prior to entering paved public roadways. • Clean (e.g., through street vacuum sweeping) visible trackout or runoff dirt from the construction site off public roadways.
Noise impacts	**General:** BMPs and mitigation measures applicable throughout multiple phases of a wind energy development project include the following: • Take advantage of topography and the distance to nearby sensitive receptors when positioning potential sources of noise. • Establish sufficient setback distances from sensitive receptors wherever feasible. Based on previous experience, noise complaints seldom exist for people living more than 1 to 1.5 miles (1.6–2.4 kilometers [km]) from a wind farm (Stewart 2006). • Select equipment with the lowest noise levels available and no prominent discrete tones, when possible. • Maintain all equipment in good working order in accordance with manufacturer specifications. Suitable mufflers and/or air-inlet silencers should be installed on all internal combustion engines and certain compressor components. • All vehicles traveling within and around the project area should operate in accordance with posted speed limits. • Establish a process for documenting, investigating, evaluating, and resolving project-related noise complaints.

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	Construction: • When possible, limit noisy construction activities to times when nearby sensitive receptors are least likely to be disturbed. • Schedule noisy activities to occur at the same time whenever feasible, since additional sources of noise generally do not greatly increase noise levels at the site boundary. Less-frequent but noisy activities would generally be less annoying than lower-level noises occurring more frequently. • Locate stationary construction equipment (e.g., compressors or generators) as far as practical from nearby sensitive receptors. • In the unlikely event that blasting or pile driving would be needed during the construction period, notify nearby residents in advance. **O&M:** • If a transformer becomes a noise issue, a new transformer with reduced flux density generating noise levels as much as 10 to 20 decibels lower than National Electrical Manufacturers Association standard values could be installed. Alternatively, barrier walls, partial enclosures, or full enclosures could be adopted to shield or contain the transformer noise, depending on the degree of noise control needed
Ecological impacts	**Project Planning and Design:** Proper siting of the project area and of specific project components is the best means for minimizing impacts on wildlife from wind energy projects. To reduce the potential for unacceptable impacts on ecological resources, the following measures should be incorporated into the project planning and siting activities: • Follow the recommendations provided in the USFWS's *Land-Based Wind Energy Guidelines* (WEG) (USFWS 2012) and, as appropriate, the Eagle Conservation Plan Guidance (USFWS 2013). In addition, follow guidelines or recommendations developed by individual states (e.g., IDNR 2011; Nebraska Wind and Wildlife Working Group 2011; SDGFP n.d. [2012]) to address potential effects of wind energy development on ecological resources. **Prepare a Bird and Bat Conservation Strategy (BBCS):** The overall goal of such a plan is to reduce or eliminate avian and bat mortality; implementation of a BBCS builds support for a finding of no significant impact when projects tier to the UGP PEIS. The wind energy facility developer should work closely with the USFWS and the appropriate state wildlife agencies to identify protective measures to include in the plan. These would include project design measures, construction phase measures, operational phase measures, and decommissioning phase measures. A minimum of 1 year of postconstruction monitoring is needed to validate the preconstruction risk assessment and allow the facility owner to adjust operations based on identified problems. Based on project location in proximity to occupancy, habitat, and other attributes that may increase the risk to birds and bats, multiyear postconstruction monitoring may be necessary at some project sites. It is of paramount importance that postconstruction surveys are accurate estimates of fatality at wind power facilities. Simple carcass counts at wind energy facilities are inaccurate and underestimate the total number of fatalities because not all carcasses are found due to factors such as unsearchable terrain, carcass removal by scavengers, and less than perfect searcher efficiency. Postconstruction surveys for mortality must be robust and standardized to provide reliable results upon which to base adaptive management decisions. For these reasons, using a fatality estimator model is critical. The USFWS recommends a model like the Evidence of Absence model developed by Huso et al. (2015). The user's guide and software developed to estimate bird and bat fatalities at wind-power facilities (Dalthorp et al. 2014) can be found at http://pubs.usgs.gov/ds/0881. The Evidence of Absence software provides for comparison of various combinations of search coverage, search interval, and searcher efficiency that all produce the same overall level of carcass detection probability. Results of monitoring activities shall be reported to the appropriate state or federal agencies in a timely manner. If bat monitoring is appropriate for the site, installation of bat acoustic monitors should be considered at the time MET towers are installed to reduce costs and minimize delays by collecting data early during the site review process. • Review existing information on species and habitats in the project area. Identify important, sensitive, or unique habitat (including large contiguous tracts of grassland habitat) and biota in the project site and vicinity, and design the project to avoid, minimize, or mitigate potential impacts on these resources. Avoidance is the typically the most effective, and therefore preferred, choice for minimizing impacts. The design and siting of the facility should follow appropriate guidance and requirements from Western and the USFWS (as specified for each species in the selected alternative in the UGP PEIS) as well as those required by state permitting agencies, and other resource agencies, as available and applicable. For birds specifically, attention should be given to project placement that may be within or near Important Bird Areas (IBAs) (http://netapp.audubon.org/iba) or Hemispheric or Regional Western Hemisphere Shorebird Reserve Network sites (http://www.whsrn.org/whsrn-sites), or where bird species or habitats of conservation concern are known to occur. The IBA Program has identified the most essential areas for birds, and conservation of these areas will provide for long-term protection of biodiversity. Sources of information on these important habitats can be found at http://ecos.fws.gov/ipac, http://www.avianknowledge.net, and http://web4.audubon.org/bird/iba.

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- Tier to the UGP PEIS. The responsible federal agency will use a tiered NEPA evaluation to document avoidance, minimization, or mitigation of impacts to important bird habitat (e.g., established private, state, or federal special management areas for birds, IBAs, Regional Western Hemisphere Shorebird Reserve Network, [http://www.whsrn.org/whsrn-sites], etc.) to achieve no significant impact to avian resources. On a project-by-project basis, developers should contact local USFWS offices early in the planning process to identify areas of conflict with specific avian species or important bird habitat. Developers shall work with USFWS and WAPA to develop avoidance, minimization, or mitigation measures to adequately demonstrate their project will have no significant impact on avian resources. In these cases, individual projects determined to be consistent with the selected alternative in the UGP PEIS will require a finding of no significant impact to document consistency.
- If significant impacts on IBAs or similar ecologically important avian areas are not avoided, minimized, or mitigated, then this UGP PEIS would not apply, and a separate project specific NEPA evaluation must be developed and approved by the appropriate responsible federal agency prior to project construction.
- Contact appropriate federal and state agencies (including state entities responsible for permitting energy development projects) early in the planning process to identify potentially sensitive ecological resources known to be present or likely to be present in the vicinity of the wind energy development.
- If appropriate, conduct surveys for presence of federal- and state-protected species and other species of concern and the habitats for such species that have a reasonable potential to occur within the project area based on habitat characteristics. Consult with the USFWS and/or appropriate state agency to identify species likely to be present and appropriate survey techniques, determine permit needs, and identify/apply species-specific avoidance and minimization measures.
- Evaluate potential avian and bat use (including the locations of active nest sites, colonies, roosts, and migration corridors) of the project and use data to plan turbine (and other structure/infrastructure) locations to minimize impacts.
- The transmission lines should be designed and constructed with regard to the recommendations in Avian Protection Plan Guidelines (APLIC and USFWS 2005), in conjunction with *Suggested Practices for Avian Protection on Power Lines* (APLIC 2006) and *Reducing Avian Collisions with Power Lines* (APLIC 2012), to reduce the operational and avian risks that result from avian interactions with electric utility facilities. For example, transmission line support structures and other facility structures should be designed to reduce the likelihood of electrocution with proper spacing of components and by the use of line marking devices, where warranted and appropriate, to reduce the likelihood of collision.
- Evaluate the potential for the wind energy project to adversely affect bald and golden eagles in a manner consistent with the *Eagle Conservation Plan Guidance* (USFWS 2013). Early in the planning of transmission interconnection and wind farm location, coordination with USFWS Field Offices regarding the guidance is highly recommended. Documented occurrence of eagles can be acquired from the local USFWS Ecological Services office, state wildlife agencies, or state natural heritage databases in some cases, although on-site surveys may be needed. In accordance with the USFWS's WEG (USFWS 2012), surveys during early project development should identify all important eagle use areas (nesting, foraging, and winter roost areas) within the project's footprint. If recent data are available on the spacing of occupied eagle nests for the project-area nesting population, these data can be used to delineate an appropriate boundary for the project area. If appropriate survey data are unavailable, the USFWS suggests that the project area, for the purpose of evaluating potential effects on eagles, be defined as the project footprint together with areas within 10 miles (16 km) of the footprint boundary. As described in the USFWS's WEG (USFWS 2012), project developers should evaluate the need to develop an eagle conservation plan.

Characterization: Site characterization activities would generally result in only minimal impacts on ecological resources because of the small areas within which activities would take place and because of the low levels of impacts generally associated with those activities. The following BMPs and mitigation measures are applicable to this phase of development to limit the potential for effects to occur to ecological resources:

- Use existing roads to the maximum extent feasible to access the proposed project area. Install MET towers and conduct other characterization activities (e.g., geotechnical testing) as close as practicable to existing access roads.
- Minimize the area disturbed during the installation of MET towers (i.e., the footprint needed for MET towers and associated laydown areas).
- Do not locate individual MET towers in or adjacent to sensitive habitats or in areas where ecological resources known to be sensitive to human activities are present.
- Schedule the installation of MET towers and other characterization activities to avoid disruption of wildlife reproductive activities or other important behaviors (e.g., do not install towers during periods of sage-grouse nesting).

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	• Avoid or minimize the use of guy wires on MET towers. Equip any needed guy wires with line marking devices. **Construction:** A variety of measures may be applicable to minimize the potential for construction activities to affect ecological resources. In addition to BMPs and mitigation measures identified for other resource areas such as soils, water, air quality, and noise, the following measures would be applicable during construction activities for wind energy projects: • Minimize the size of areas in which soil would be disturbed or vegetation would be removed. • Minimize the number of road miles of new road construction needed for the project. • Reduce habitat disturbance by keeping vehicles on access roads and minimizing foot and vehicle traffic through undisturbed areas. • Consult with the appropriate natural resource agencies to avoid scheduling construction activities during important periods for wildlife courtship, breeding, nesting, lambing, or calving that are applicable to sensitive species within the project area. • Instruct employees, contractors, and site visitors to avoid harassment and disturbance of wildlife, especially during reproductive (e.g., courtship and nesting) seasons. Pets should not be allowed on the project area. • Establish buffer zones around known raptor nests, bat roosts, and biota and habitats of concern if site evaluations show that proposed construction activities would pose a significant risk to avian or bat species of concern. • Avoid constructing turbines in areas of concentrated prey base for raptors (e.g., prairie dog towns). • If needed during construction, only use explosives within specified times and at specified distances from sensitive wildlife or surface waters as established by the appropriate federal and state agencies. • Minimize the use of guy wires on permanent MET towers or use designs for towers that do not require guy wires. If guy wires are necessary, they should be equipped with line marking devices. • Initiate habitat restoration of disturbed soils and vegetation as soon as possible after construction activities are completed. Restore areas of disturbed soil using weed-free native grasses, forbs, and shrubs, in consultation with land managers and appropriate agencies such as state or county extension offices or weed boards. • Minimize the amount of lighting installed on project turbines; all outdoor lighting on project buildings should be downshielded. • Develop a plan for control of noxious weeds and invasive plants that could occur as a result of new surface disturbance activities at the site. The plan should address monitoring, weed identification, the manner in which weeds spread, and methods for treating infestations. Require the use of certified weed-free mulching. • Establish a controlled inspection and cleaning area for trucks and construction equipment are arriving from locations with known invasive vegetation problems. Visually inspect construction equipment arriving at the project area and remove and contain seeds that may be adhering to tires and other equipment surfaces. • Regularly monitor access roads and newly established utility and transmission line corridors for the establishment of invasive species. Initiate weed control measures immediately upon evidence of the introduction or establishment of invasive species. • Place marking devices on any newly constructed or upgraded transmission lines, where appropriate, within suitable habitats for sensitive bird species. • Promptly dispose of all garbage or human waste generated on site in order to avoid attracting nuisance wildlife. • Do not use fill materials that originate from areas with known invasive vegetation problems. **O&M:** A variety of measures may be implemented to minimize the potential for impact to ecological resources during the operations phase of a wind energy project, including the following: • Access roads, utility and transmission line corridors, and tower site areas should be monitored regularly for the establishment of invasive species, and weed control measures should be initiated immediately upon evidence of the introduction of invasive species. • Regularly inspect access roads, utility and transmission line corridors, and tower site areas for damage from erosion, washouts, and rutting. Initiate corrective measures immediately upon evidence of damage.

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	• Turn off unnecessary lighting at night to limit attraction of migratory birds. Follow lighting guidelines, where applicable, from the WEG (USFWS 2012:50, items 10 and 11). This includes using lights with timed shutoff, downward-directed lighting to minimize horizontal or skyward illumination, and avoidance of steady-burning, high-intensity lights. • Increasing turbine cut-in speeds (i.e., prevent turbine rotation at lower wind velocity) in areas of bat conservation concern during times when active bats may be at particular risk from turbines (Arnett et al. 2011). • Instruct employees, contractors, and site visitors to avoid harassment and disturbance of wildlife, especially during reproductive (e.g., courtship and nesting) seasons. Pets should not be allowed on the project area. • In the absence of long-term mortality studies, monitor regularly for potential wildlife problems, including wildlife mortality. Report observations of potential wildlife problems, including wildlife mortality, to the appropriate state or federal agency in a timely manner, and work with the agencies to use this information to avoid/minimize/offset impacts. The Ecological Services Division of the USFWS shall be contacted. Development of additional mitigation measures may be necessary. **Decommissioning:** Many BMPs and mitigation measures applicable to construction activities are also applicable to decommissioning activities. One goal of decommissioning should be implementation of appropriate habitat restoration activities to return disturbed areas to pre-project conditions. Additional BMPs and mitigation measures specifically applicable to addressing potential impacts of decommissioning activities on ecological resources include the following: • All turbines and ancillary structures should be removed from the site. • Salvage and reapply topsoil excavated during decommissioning activities to disturbed areas during final restoration activities. • Reclaim areas of disturbed soil using weed-free native shrubs, grasses, and forbs. Restore the vegetation cover, composition, and diversity to values commensurate with the ecological setting. • Facilities constructed on federal lands should follow the decommissioning recommendations provided in the USFWS's WEG (USFWS 2012).
Visual	**Mitigation Measures Related to Project Siting:** The greatest potential for visual impacts associated with wind energy facilities and associated electricity transmission systems would occur as a result of decisions made during the siting and design of the projects. In many cases, visual impacts associated with these facilities could be avoided or substantially reduced by careful project siting. Assessment of visual resources needs to be part of the project's early pre-planning phases and must continue throughout the life of the project. A professional landscape architect should be a part of the planning team evaluating visual resource issues as project siting options are considered. The professional landscape architect and the planning team as a whole should use procedures for conducting detailed visual resource analyses that identify and map landscape characteristics, key observation points (KOPs), and key viewsheds; prominent scenic and cultural landmarks; and other visually sensitive areas near the project location. The appropriate land management agencies, planning entities, and local public should be consulted to provide input on the identification of important visual resources in the project area and on the siting and design process. The public should be involved and informed about the visual site design elements of the proposed wind energy projects. Possible approaches include conducting public forums for disseminating information regarding facets of wind energy development, such as design, operations, and productivity; offering organized tours of operating wind energy development projects; using computer simulation and visualization techniques in public presentations; and conducting surveys regarding public perceptions and attitudes about wind energy development. Geographic information system (GIS) tools and visual impact simulations are valuable for conducting visual analyses (including mapping), analyzing the visual characteristics of landscapes, visualizing the potential impacts of project siting and design, and fostering the type of communication among stakeholders that informs decision making. The visual analyses provide data that would be critical for identifying constraints and opportunities for siting projects to minimize visual impacts. All the above are typical components of both developer project planning and agency environmental documentation. The following specific project-siting measures could help reduce visual impacts of wind energy development, and should be employed where appropriate and feasible: • Because the landscape setting observed from national historic sites, national trails, and tribal cultural resources may be a part of the historic context contributing to the historic significance of the site or trail, project siting should avoid locating facilities that would alter the visual setting such as would reduce the historic significance or function.

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	• Where possible, projects should be sited outside the viewsheds of KOPs, highly sensitive viewing locations, and/or areas with limited visual absorption capability and/or high scenic integrity. When wind energy developments and associated facilities must be sited within view of KOPs, they should be sited as far away as possible, since visual impacts generally diminish as viewing distance increases. • Where possible, developments should be sited in already industrialized and developed landscapes, with due consideration for visual absorption capacity and possible cumulative effects. • Siting should take advantage of both topography and vegetation (where possible) as screening devices to restrict views of projects from visually sensitive areas. • The eye is naturally drawn to prominent landscape features (e.g., knobs and waterfalls); thus, projects and their elements should not be sited next to such features, where possible. • The eye naturally follows strong natural lines in the landscape, and these lines and associated landforms can "focus" views on particular landscape features. For this reason, linear facilities associated with a wind energy project, such as transmission lines and roads, generally should not be sited so that they bisect ridge tops or run down the center of valley bottoms. • Although wind turbines may sometimes be located on ridgelines, skylining of substations, transmission structures, communication towers, and other structures associated with wind energy developments should be avoided; that is, they should not be placed on ridgelines, summits, or other locations where they will be silhouetted against the sky from important viewing locations. Siting should avoid skylining by taking advantage of opportunities to use topography as a backdrop for views of facilities and structures. The presence of these structures should be concealed or made less conspicuous by siting and designing them to harmonize with desirable or acceptable characteristics of the surrounding environment. • Wind turbines should be sited properly to eliminate shadow flicker effects on nearby residences or other highly sensitive viewing locations, or reduce them to the lowest achievable levels, as calculated using appropriate siting software and procedures. Accurately determined shadow flicker estimates should be made available to stakeholders in advance of project approval. If turbine locations are changed during the siting process, shadow flicker effects should be recalculated and made available to potentially affected stakeholders. • Spatially accurate and realistic photo simulations of wind turbines in the proposed location should be prepared as part of the siting process. Simulations should show views from sensitive visual resource areas; highly sensitive viewing locations, such as residences; and more representative typical viewing locations. Stakeholders should be involved in selecting KOPs for simulations. Where feasible, simulations should portray a range of lighting conditions and sun angles. Simulations should be based on accurate spatial information, particularly elevation data, and must account for screening vegetation and structures. Simulations should show enough of the surrounding landscape to show the project in the appropriate spatial context and should be reproduced at a large enough size to be comfortably viewed from the appropriate specified distance to accurately depict the apparent size of the facility in a real setting. • As feasible, siting of linear features (rights-of-way [ROWs] and roads) associated with wind energy developments should follow natural land contours rather than straight lines, particularly up slopes. Fall-line cuts should be avoided. Where it can be accomplished without introducing unacceptable impacts on other resources, following natural contours echoes the lines found in the landscape and often reduces cut-and-fill requirements; straight lines can introduce conspicuous linear contrasts that appear unnatural. • Siting of facilities, especially linear facilities, should take advantage of natural topographic breaks (i.e., pronounced changes in slope), and siting of facilities on steep side slopes should be avoided. Facilities sited on steep slopes are often more visible (particularly if either the project or viewer is elevated); in addition, they may be more susceptible to soil erosion, which could contribute to negative visual impacts. • In forested areas or shrublands, where possible, linear facilities should follow the edges of clearings (where they would be less conspicuous) rather than pass through their center. • Because visual impacts are usually lessened when vegetation and ground disturbances are minimized, where possible, in forested areas or shrublands, siting should take advantage of existing clearings to reduce vegetation clearing and ground disturbance. • Locations for transmission line and ROW road crossings of other roads, streams, and other linear features within a corridor should be chosen to avoid KOP viewsheds and other visually sensitive areas and to minimize disturbance to vegetation and landforms. The ROWs should cross linear features (e.g., trails, roads, and rivers) at right angles whenever possible to minimize the viewing area and duration.

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	• To the extent possible, transmission lines and roads associated with wind energy facilities should be collocated within a corridor to use existing/shared ROWs, existing/shared access and maintenance roads, and other infrastructure in order to reduce visual impacts associated with new construction. **Mitigation Measures Related to Project Design:** Most visual impact mitigation measures that apply to siting wind energy facilities as a whole would also apply to the siting and design of individual facilities, structures, roads, and other components of the projects. A number of additional mitigation measures are directed at minimizing vegetation and ground disturbance to lessen associated visual impacts: • Wind turbine siting should be sensitive to and respond to the surrounding landscape in a visually pleasing way. For example, in rolling landscapes, a less rectilinear and rigid configuration of turbines that follows local topography may be appropriate. In flatter agricultural landscapes with rectilinear patterns of road and fields, a more geometric or linear wind turbine configuration may be preferred. • To the extent possible, given the terrain of a site, wind turbines should be clustered or grouped when placed in large numbers, but a cluttering effect should be avoided by separating otherwise overly long lines of turbines or large arrays, and breaks or open zones should be inserted to create distinct visual units or groups of turbines. • Project design should provide visual order and unity among clusters of turbines (visual units) to avoid visual disruptions and perceived "disorder, disarray, or clutter." • Wind turbines should exhibit visual uniformity in the shape, color, and size of rotor blades, nacelles, and towers. • Power collection cables or lines on the site should be buried in a manner that minimizes additional surface disturbance (e.g., collocating them with access roads). • For ancillary buildings and other structures, low-profile structures should be chosen whenever possible to reduce their visibility. • Where screening topography and vegetation are absent, natural-looking earthwork berms and vegetative or architectural screening should be used to minimize visual impacts associated with ancillary facilities. Vegetative screening can be particularly effective along roadways. • The siting and design of facilities, structures, roads, and other project elements should match and repeat the form, line, color, and texture of the existing landscape. • In forested areas and shrublands, openings in vegetation for facilities, structures, roads, etc., should mimic the size, shape, and characteristics of naturally occurring openings to the extent possible. • Through site design, the number of structures required should be minimized. Activities should be combined and carried out in one structure, or structures should be collocated to share pads, fences, access roads, lighting, etc. • Structures and roads should be designed and located to minimize and balance cuts and fills. Reducing cut and fill has numerous visual benefits, including fewer fill piles, landforms and vegetation that appear more natural, fewer or reduced color contrasts with disturbed soils, and reduced visual disturbance from erosion and the establishment of invasive species. • Facilities, structures, and roads should be located in stable fertile soils to reduce visual contrasts from erosion and to better support rapid and complete regrowth of affected vegetation. Site hydrology should also be carefully considered in siting operations to avoid visual contrasts from erosion. Strip, stockpile, and stabilize topsoil from the site before excavating earth for facility construction. • The vegetation-clearing design in forested areas should include the feathering of cleared area edges (i.e., the progressive and selective thinning of trees from the edge of the clearing inward) combined with the mixing of tree heights from the edge to create an irregular vegetation outline. These actions would result in a more natural-appearing edge, thereby avoiding the very high linear contrasts associated with straight-edged, clear-cut areas. • Structures, roads, and other project elements should be set as far back from road, trail, and river crossings as possible, and vegetation should be used to screen views from crossings, where feasible. **Mitigation Measures Related to Building and Structural Materials:** Visual impacts associated with wind energy facilities and associated electricity transmission could be partially mitigated by choosing appropriate building and structural materials and surface treatments (i.e., paints or coatings designed to reduce contrast and reflectivity). A careful study of the site should be performed to identify appropriate colors and textures for materials; both summer and winter appearance should be considered, as well as seasons of peak visitor use. The choice of colors should be based on the appearance at typical viewing

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distances and consider the entire landscape around the proposed development. Appropriate colors for smooth surfaces often need to be two to three shades darker than the background color to compensate for shadows that darken most textured natural surfaces.

Specific mitigation measures that could be found appropriate and feasible include the following:

- The use of monopole structures is recommended. Truss or lattice-style wind turbine structures with lacework or pyramidal or prismatic shapes should be avoided. Monopole structures present a simpler profile, and less complex surface characteristics and reflective/shading properties.
- Color selections for turbines should be made to reduce visual impact and should be applied uniformly to tower, nacelle, and rotor, unless gradient or other patterned color schemes are used.
- Grouped structures should all be painted the same color to reduce visual complexity and color contrast.
- For ancillary structures, materials and surface treatments should repeat and/or blend with the existing form, line, color, and texture of the landscape. If the project will be viewed against an earthen or other non-sky background, appropriately colored materials should be selected for structures, or appropriate stains/coatings should be applied to blend with the project's backdrop.
- The operator should use nonreflective paints and coatings on wind turbines, visible ancillary structures, and other equipment to reduce reflection and glare.
- Turbines, visible ancillary structures, and other equipment should be painted before or immediately after installation.
- For ancillary facilities, multiple-color camouflage technology applications should be considered for projects within sensitive viewsheds and with a visibility distance between 0.25 to 2 miles (0.4–3.2 km).
- Electricity transmission projects associated with wind energy facilities should use nonspecular conductors and nonreflective coatings on insulators.
- For transmission structures, monopoles may reduce visual impacts more effectively than lattice structures in foreground and middle-ground views, while lattice structures may be more appropriate for more distant views, where the latticework would "disappear," allowing background textures to show through.
- Lighting for facilities should not exceed the minimum required for safety and security, and full-cutoff designs that minimize upward light scattering (light pollution) should be selected. If possible, site design should be accomplished to make security lights nonessential. Such lights increase the contrast between a wind energy project and the night sky, especially in rural/remote environments common to UGP region. Where they are necessary, security lights should be extinguished except when activated by motion detectors (e.g., only around the substation).
- Commercial messages and symbols (such as logos, trademarks) on wind turbines should be avoided and should not appear on sites or ancillary structures of wind energy projects. Similarly, billboards and advertising messages should also be discouraged.

Mitigation Measures Related to Construction: Visual impacts associated with construction activities can be partially mitigated by implementing the following measures, where appropriate and feasible:

- Where possible, staging and laydown areas should be sited outside the viewsheds of KOPs and not in visually sensitive areas; they should be sited in swales, around bends, and behind ridges and vegetative screens, where these screening opportunities exist.
- A site restoration plan should be in place prior to construction. Restoration of the construction areas should begin immediately after construction to reduce the likelihood of visual contrasts associated with erosion and invasive weed infestation and to reduce the visibility of affected areas as quickly as possible.
- Disturbed surfaces should be restored to their original contours as closely as possible and revegetated immediately after, or contemporaneously with, construction. Prompt action should be taken to limit erosion and to accelerate restoring the preconstruction color and texture of the landscape.
- Visual impact mitigation objectives and activities should be discussed with equipment operators before construction activities begin.
- Penalty clauses should be used to protect trees and other sensitive visual resources.
- Existing rocks, vegetation, and drainage patterns should be preserved to the maximum extent possible.
- Valuable trees and other scenic elements can be protected by clearing only to the edge of the designed grade manipulation and not beyond through the use of retaining walls, and by protecting tree roots and stems from construction activities. Brush-beating or mowing rather than vegetation removal should be done, where feasible.

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- Slash from vegetation removal should be mulched and spread to cover fresh soil disturbances (preferred) or should be buried. Slash piles should not be left in sensitive viewing areas.
- Installation of gravel and pavement should be avoided where possible to reduce color and texture contrasts with the existing landscape.
- For road construction, excess fill should be used to fill uphill-side swales to reduce slope interruption that would appear unnatural and to reduce fill piles.
- The geometry of road ditch design should consider visual objectives; rounded slopes are preferred to V-shaped and U-shaped ditches.
- Road-cut slopes should be rounded, and the cut/fill pitch should be varied to reduce contrasts in form and line; the slope should be varied to preserve specimen trees and nonhazardous rock outcroppings.
- Planting pockets should be left on slopes, where feasible.
- Benches should be provided in rock cuts to accent natural strata.
- Topsoil from cut/fill activities should be segregated and spread on freshly disturbed areas to reduce color contrast and aid rapid revegetation. Topsoil piles should not be left in sensitive viewing areas.
- Excess fill material should not be disposed of downslope in order to avoid creating color contrast with existing vegetation/soils.
- Excess cut/fill materials should be hauled in or out to minimize ground disturbance and impacts from fill piles.
- Soil disturbance should be minimized in areas with highly contrasting subsoil color.
- Natural or previously excavated bedrock landforms should be sculpted and shaped when excavation of these landforms is required. A percentage of backslope, benches, and vertical variations should be integrated into a final landform that repeats the natural shapes, forms, textures, and lines of the surrounding landscape. The earthen landform should be integrated and transitioned into the excavated bedrock landform. Sculpted rock face angles, bench formations, and backslope need to adhere to the natural bedding planes of the natural bedrock geology. Half-case drill traces from pre-split blasting should not remain evident in the final rock face. Where feasible, the color contrast should be removed from the excavated rock faces by color- treating with a rock stain.
- Where feasible, construction on wet soils should be avoided to reduce erosion.
- Communication and other local utility cables should be buried, where feasible.
- Culvert ends should be painted or coated to reduce color contrasts with existing landscape.
- Signage should be minimized; reverse sides of signs and mounts should be painted or coated to reduce color contrasts with the existing landscape.
- The burning of trash should be prohibited during construction; trash should be stored in containers and/or hauled off-site.
- Litter must be controlled and removed regularly during construction.
- Dust abatement measures should be implemented in arid environments to minimize the impacts of vehicular and pedestrian traffic, construction, and wind on exposed surface soils.

Mitigation Measures Related to O&M: Visual impacts associated with O&M activities could be partially mitigated by implementing the following measures, where appropriate and feasible:

- Wind facilities and sites should be actively and carefully maintained during operation. Wind energy projects should evidence environmental care, which would also reinforce the expectation and impression of good management for benign or clean power.
- Inoperative or incomplete turbines cause the misperception in viewers that “wind power does not work” or that it is unreliable. Inoperative turbines should be repaired, replaced, or removed quickly. Nacelle covers and rotor nose cones should always be in place and undamaged.
- Nacelles and towers should be cleaned regularly (yearly, at minimum) to remove spilled or leaking fluids and the dirt and dust that accumulates, especially in seeping lubricants.
- Facilities and off-site surrounding areas should be kept clean of debris, “fugitive” trash or waste, and graffiti. Scrap heaps and materials dumps should be prohibited and prevented. Materials storage yards, even if thought to be orderly, should be kept to an absolute minimum. Surplus, broken, disused materials and equipment of any size should not be allowed to accumulate.

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	• Maintenance activities should include dust abatement (in arid environments), litter cleanup, and noxious weed control. • Road maintenance activities should avoid blading of existing forbs and grasses in ditches and adjacent to roads; however, any invasive or noxious weeds should be controlled as needed. • Interim restoration should be undertaken during the operating life of the project as soon as possible after disturbances. **Mitigation Measures Related to Decommissioning:** As noted above, a reclamation plan that includes visual impact mitigation measures should be in place prior to construction, and reclamation activities should be undertaken as soon as possible after disturbances occur and be maintained throughout the life of the project. The following reclamation activities/practices can partially mitigate visual impacts associated with electricity transmission/distribution lines and pipelines, where appropriate and feasible: • All aboveground and near-ground structures should be removed. • Soil borrow areas, cut-and-fill slopes, berms, water bars, and other disturbed areas should be contoured to approximate naturally occurring slopes, thereby avoiding form and line contrasts with the existing landscapes. Contouring to rough texture would trap seed and discourage off-road travel, thereby reducing associated visual impacts. • Cut slopes should be randomly scarified and roughened to reduce texture contrasts with existing landscapes and to aid in revegetation. • Combining seeding, planting of nursery stock, transplanting of local vegetation within the proposed disturbance areas, and staging of construction should be considered, enabling direct transplanting. Generally, native vegetation should be used for revegetation, establishing a composition consistent with the form, line, color, and texture of the surrounding undisturbed landscape. Seed mixes should be coordinated with local authorities, such as country extension services, weed boards, or land management agencies. • Gravel and other surface treatments should be removed or buried. • Rocks, brush, and forest debris should be restored, whenever possible, to approximate preexisting visual conditions. **Other Mitigation Methods:** In addition to mitigation measures that directly reduce the visual resource impacts of wind energy and associated facilities, aesthetic offsets present a mitigation option in some situations. Aesthetic offsets should be considered in situations where visual impacts are unavoidable or where alternative mitigation options are only partially effective or uneconomical. An aesthetic offset is a correction or remediation of an existing condition located in the same viewshed of the proposed development that has been determined to have a negative visual or aesthetic impact. For example, aesthetic offsets could include reclamation of unnecessary roads in the area, removal of abandoned buildings, cleanup of illegal dumps or trash, or the rehabilitation of existing erosion or disturbed areas.
Paleontological resources	To mitigate or minimize potential paleontological resource impacts, the following mitigation measures could be adopted: • Whether paleontological resources exist in a project area should be determined on the basis of the sedimentary context and soil surveys of the area, a records search of federal, state, and local inventories for past paleontological finds in the area, review of past paleontological surveys, and/or a paleontological survey. • Placement of wind energy structures in fossil-rich areas, such as outcrops, should be avoided. • A paleontological resources management plan should be developed for areas where there is a high potential for paleontological material to be present. Management options may include avoidance, removal of the fossils, or monitoring. If the fossils are to be removed, a mitigation plan should be drafted identifying the strategy for collection of the fossils in the project area. Often it is unrealistic to remove all of the fossils, in which case a sampling strategy can be developed. If an area exhibits a high potential, but no fossils were observed during surveying, monitoring could be required. A qualified paleontologist should monitor all excavation and earthmoving in the sensitive area. Whether the strategy chosen is excavation or monitoring, a report detailing the results of the efforts should be produced. • If an area has a strong potential for containing fossil remains and those remains are exposed on the surface for potential collection, steps should be taken to educate workers and the public on the consequences of unauthorized collection.

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Cultural resources	The following mitigation measures could be implemented to address potential impacts to cultural resources: • The appropriate federal agency should consult with federally recognized Native American governments early in the planning process for a wind energy development to identify issues and areas of concern. Consultation is required under the National Historic Preservation Act. Consultation is necessary to establish whether the project is likely to disturb traditional cultural properties, affect access rights to particular locations, disrupt traditional cultural practices, affect trust resources such as eagles, and/or visually impact areas important to the Tribe(s). • The presence of archaeological sites and historic properties in the area of potential effect should be determined on the basis of a records search of recorded sites and properties in the area and/or an archaeological survey. The State Historic Preservation Office (SHPO) is the primary repository for cultural resource information. The National Register of Historic Places (NRHP) could also be consulted at http://www.nps.gov/nr/research/index.htm. • Archaeological sites and historic properties present in locations that would be affected by project activities should be reviewed to determine whether they meet the criteria of eligibility for listing on the NRHP. Cultural resources listed on or eligible for listing on the NRHP are considered "significant" resources. • If a development is within the viewshed of a national historic trail eligible for listing on the NRHP, the Applicant should evaluate the potential visual impacts on the trail associated with the proposed project. If impacts were to occur, mitigation measures such as vegetation or landscape screening could be employed. Other mitigation options are identified in Section 5.7.1.3. • If cultural resources are known to be present at the site, or if areas with a high potential to contain cultural material have been identified, consultation with the SHPO should be undertaken by the appropriate federal agency (e.g., WAPA, USFWS, U.S. Forest Service, or Bureau of Land Management). In instances where federal oversight is not appropriate, developers can interact directly with the SHPO. Avoidance of these resources is always the preferred mitigation option. Other mitigation options include archaeological survey, excavation, data recovery, and monitoring (as warranted). If an area exhibits a high potential but no artifacts are observed during an archaeological survey, monitoring by a qualified archaeologist could be required during all excavation and earthmoving in the high-potential area. A report should be prepared documenting these activities. Other steps include the identification and implementation of measures to prevent potential looting/vandalism or erosion impacts, as well as educating workers and the public to make them aware of the consequences of unauthorized collection of artifacts. • Periodic monitoring of significant cultural resources in the vicinity of development projects may help curtail potential looting/vandalism and erosion impacts. If impacts are recognized early, additional actions can be taken before the resource is destroyed. Monitoring activities do not require federal involvement. • Cultural resources discovered during construction should immediately be brought to the attention of the responsible federal agency. Work should be immediately halted in the vicinity of the find to avoid further disturbance to the resources while they are being evaluated and appropriate mitigation plans are being developed. • If human remains are found on a development site, work should cease immediately in the vicinity of the find. The appropriate law enforcement officials and the appropriate federal agency should be contacted. No material should be removed from the find location. Once it is determined that the remains belong to an archaeological site, the appropriate SHPO should be contacted to determine how the remains should be addressed. • Significant cultural resources can be affected by soil erosion. See the mitigation measures discussed in Section 5.2.1.7 for methods that could control soil erosion during a development project. Minimization of soil erosion would protect important resources from damage.
Hazardous materials	Means to eliminate or reduce adverse impacts from hazardous materials and wastes include compliance with applicable laws, ordinances, and regulations and conformance with relevant industry standards (including those issued by nonregulatory bodies such as the National Fire Protection Association). Wind energy facility projects issued ROWs by federal agencies, including the USFWS, and interconnection access to transmission facilities operated by Western or other transmission system operators will be required to incorporate elements of relevant construction standards and interconnection requirements as well as the reliability requirements of Federal Energy Regulatory Commission orders. Developers of wind energy facilities should prepare several plans addressing various aspects of hazardous materials and waste, including a hazardous materials and waste management plan, a construction and operation waste management plan, a fire management and protection plan, an integrated pest and vegetation management plan (if the facility will use pesticides/herbicides), and a spill prevention and emergency response plan. Such plans should include the following items:

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	• Prepare a hazardous materials and waste management plan that addresses the selection, transport, storage, and use of all hazardous materials needed for construction, operation, and decommissioning of the facility for local emergency response and public safety authorities and for the regulating agency, and that addresses the characterization, on-site storage, recycling, and disposal of all resulting wastes. The plan should include a comprehensive hazardous materials inventory; Material Safety Data Sheets for each type of hazardous material; emergency contacts and mutual aid agreements, if any; site map showing all hazardous materials and waste storage and use locations; copies of spill and emergency response plans (see below), and hazardous materials-related elements of a decommissioning/closure plan. The waste management plan should identify the waste streams that are expected to be generated at the site during construction and operation and address hazardous waste determination procedures, waste storage locations, waste-specific management and disposal requirements (e.g., selecting appropriate waste storage containers, appropriate off-site treatment, storage, and disposal facilities), inspection procedures, and waste minimization procedures. The plan should address solid and liquid wastes that may be generated at the site in compliance with Clean Water Act requirements if a National Pollutant Discharge Elimination System permit is needed. • Develop a fire management and protection plan to implement measures to minimize the potential for fires associated with substances used and stored at the site. The flammability of the specific chemicals used at the facility should be considered. • If pesticides/herbicides are to be used on the site, develop an integrated pest and vegetation management plan to ensure that applications will be conducted within the framework of managing agencies and will entail the use of only U.S. Environmental Protection Agency–registered pesticides/herbicides that are 1) nonpersistent and immobile and 2) applied by licensed applicators in accordance with label and application permit directions, following stipulations regarding suitability for terrestrial and aquatic applications. Potentially applicable mitigation measures for hazardous materials and wastes at wind energy facilities include the following: • All site characterization, construction, operation, and decommissioning activities should be conducted in compliance with applicable federal and state laws and regulations, including the Toxic Substances Control Act of 1976, as amended (15 United States Code 2601, et seq.). In addition, any release of toxic substances (leaks, spills, and the like) in excess of the reportable quantity established by 40 CFR Part 117 should be reported as required by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, Section 102b. A copy of any report required or requested by any federal agency or state government as a result of a reportable release or spill of any toxic substances should be furnished to the authorized officer concurrent with the filing of the reports to the involved federal agency or state government. • Spills should be immediately addressed per the appropriate spill management plan, and cleanup and removal initiated, if needed. O&M personnel should be trained in spill prevention and containment, and spill containment supplies should be located on site and be readily available. • All vehicles and equipment should be in proper working condition to ensure that there is no potential for leaks of motor oil, antifreeze, hydraulic fluid, grease, or other hazardous materials. • Hazardous materials and waste storage areas or facilities should be formally designated and access to them restricted to authorized personnel. Construction debris, especially treated wood, should not be disposed of or stored in areas where it could come in contact with aquatic habitats. • Design requirements should be established for hazardous materials and waste storage areas that are consistent with accepted industry practices as well as applicable federal, state, and local regulations and that include, at a minimum, containers constructed of compatible materials, properly labeled, and in good condition; secondary containment features for liquid hazardous materials and wastes; physical separation of incompatible chemicals; and fire-fighting capabilities when warranted. • Written procedures should be established for inspecting hazardous materials and waste storage areas and for plant systems containing hazardous materials; identified deficiencies and their resolution should be documented. • Schedules should be established for the regular removal of wastes (including sanitary wastewater generated in temporary, portable sanitary facilities) for delivery by licensed haulers to appropriate off-site treatment or disposal facilities. • During facility decommissioning, the following should occur: emergency response capabilities should be maintained throughout the decommissioning period as long as hazardous materials and wastes remain on-site, and emergency response planning should be extended to any temporary material and equipment storage areas that may have been established; temporary waste storage areas should be properly designated, designed, and equipped; hazardous materials removed from systems should be properly containerized and characterized, and recycling options should be identified and pursued; off-site transportation of recovered hazardous materials and wastes resulting from decommissioning activities

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	should be conducted by authorized carriers; hazardous materials and waste should be removed from on-site storage and management areas, and the areas should be surveyed for contamination and remediated as necessary.
Health and safety	**Occupational Health and Safety:** The following mitigation measures to protect wind energy facility and transmission line workers are applicable during all phases associated with a project. • All site characterization, construction, operation, and decommissioning activities must be conducted in compliance with applicable federal and state occupational safety and health standards (e.g., the Occupational Safety and Health Administration's [OSHA's] Occupational Safety and Health Standards, 29 CFR 1910 and 1926). • Conduct a safety assessment to describe potential safety issues and the means that would be taken to mitigate them, covering issues such as site access, construction, safe work practices, security, heavy equipment transportation, traffic management, emergency procedures, and fire control. • Develop a health and safety program to protect workers during site characterization, construction, operation, and decommissioning of a wind energy project. The program should identify all applicable federal and state occupational safety standards and establish safe work practices addressing all hazards, including requirements for developing the following plans: general injury prevention; PPE requirements and training; respiratory protection; hearing conservation; electrical safety; hazardous materials safety and communication; housekeeping and material handling; confined space entry; hand and portable power tool use; gas-filled equipment use; and rescue response and emergency medical support, including on-site first-aid capability. • As needed, the health and safety program must address OSHA standard practices for the safe use of explosives and blasting agents (if needed for site development); measures for reducing occupational electric and magnetic field (EMF) exposures; the establishment of fire safety evacuation procedures; and required safety performance standards (e.g., electrical system standards and lighting protection standards). The program should include training requirements for applicable tasks for workers and establish procedures for providing required training to all workers. Documentation of training and a mechanism for reporting serious accidents to appropriate agencies should be established. • Design all electrical systems to meet all applicable safety standards (e.g., the National Electrical Safety Code) and comply with the interconnection requirements of the transmission system operator. • In the event of an accidental release of hazardous substances to the environment, document the event, including a root cause analysis, a description of appropriate corrective actions taken, and a characterization of the resulting environmental or health and safety impacts. Documentation of the event should be provided to permitting agencies and other appropriate federal and state agencies within 30 days, as required. **Public Health and Safety:** The following mitigation measures for the protection of public health and safety are applicable during all phases associated with a wind energy project: • Develop a project health and safety program that addresses protection of public health and safety during site characterization, construction, O&M, and decommissioning activities for a wind energy project. The program should establish a safety zone or setback for wind energy facilities and associated transmission lines from residences and occupied buildings, roads, ROWs, and other public access areas that is sufficient to prevent accidents resulting from various hazards during all phases of development. It should identify requirements for temporary fencing around staging areas, storage yards, and excavations during construction or decommissioning activities. It should also identify measures to be taken during the operations phase to limit public access to facilities (e.g., equipment with access doors should be locked to limit public access, and permanent fencing with slats should be installed around electrical substations). • Develop a traffic management plan for the site access roads to control hazards that could result from increased truck traffic (most likely during construction or decommissioning), ensuring that traffic flow would not be adversely affected and that specific issues of concern (e.g., the locations of school bus routes and stops) are identified and addressed. This plan should incorporate measures such as informational signs, flaggers (when equipment may result in blocked throughways), and traffic cones to identify any necessary changes in temporary lane configurations. The plan should be developed in coordination with local planning authorities. • Site and design wind energy facilities to eliminate glint and glare effects on roadway users, nearby residences, commercial areas, or other highly sensitive viewing locations, or reduce it to the lowest achievable levels.

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	• Use proper signage and/or engineered barriers (e.g., fencing) to limit access to electrically energized equipment and conductors in order to prevent access to electrical hazards by unauthorized individuals or wildlife. • If operation of the wind energy facility and associated transmission lines and substations could cause potential adverse impacts on nearby residences and occupied buildings as a result of noise, sun reflection, or EMF, incorporate recommendations for addressing these concerns into the project design (e.g., establishing a sufficient setback from transmission lines). • Site and design the project to comply with FAA regulations, including lighting requirements, and to avoid potential safety issues associated with proximity to airports, military bases or training areas, or landing strips. • Develop a fire management and protection plan to implement measures to minimize the potential for a human-caused fire and to respond to human- caused or natural-caused fires. • Project developers shall work with appropriate agencies (e.g., U.S. Department of Energy and Transportation Security Administration) to address critical infrastructure and key resource vulnerabilities at wind energy facilities, and to minimize and plan for potential risks from natural events, sabotage, and terrorism.

Source: WAPA and USFWS (2015).

* "project," "developers," "project site," "site boundary," "footprint," and "footprint boundary," etc., are terms used throughout this table (which has been adapted from the UGP PEIS) to refer to general requirements for the development of wind projects. Although these terms may not match the rest of this EA, it should be assumed that they apply to this Project and Philip Wind Partners (Applicant).