CHAPTER 3: AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter discusses environmental and human resources, including areas such as land use and economics that could be affected by the Grapevine Canyon Wind Project and describes the environmental consequences (direct and indirect impacts) of the proposed wind park, transmission tie-line, and Western's switchyard. The discussion of these topics under each resource section is structured into the Affected Environment and Environmental Consequences. The Affected Environment describes the existing conditions within the study area specific to the resource or other areas of interest to establish the base condition. As part of this description, a resource evaluation area is described. The resource evaluation area is the physical area that bounds the environmental, sociological, economic, or cultural feature of interest that could be impacted by construction and operation of the proposed project. The boundary of the resource evaluation area varies depending on the resource being analyzed.

The Environmental Consequences sections under each resource are the scientific and analytical basis for the EIS and provide an assessment of potential impacts resulting from implementation of the proposed project. An environmental impact is a change in the status of the existing environment as a direct or indirect result of the proposed project. Impacts can be direct or indirect, positive (beneficial) or negative (adverse), and permanent (long-term) or temporary (short-term). Direct impacts are those that are the result of construction, operation, and/or maintenance, whereas indirect impacts generally occur following construction and may not be directly related to the project. Short-term impacts are generally associated with the construction phase of the project, while long-term impacts remain for the life of the proposed project and beyond. To define the criteria for impact evaluation, "thresholds of significance" for a given environmental effect are provided for each resource area. These thresholds of significance establish benchmarks for increasing levels of effects, the highest of which is "significant impact." Per 40 CFR 1508.27, "significantly" as used in NEPA requires considerations of both context and intensity. (a) Context. This means that the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance would usually depend upon the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant. (b) Intensity. This refers to the severity of impact. Responsible officials must bear in mind that more than one agency could make decisions about partial aspects of a major action[1].

[1] The following should be considered in evaluating intensity:

1. Impacts that could be both beneficial and adverse. A significant effect could exist even if the Federal agency believes that on balance the effect would be beneficial.
2. The degree to which the proposed action affects public health or safety.
3. Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.
4. The degree to which the effects on the quality of the human environment are likely to be highly controversial.
5. The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.
6. The degree to which the action could establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.
7. Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.
8. The degree to which the action could adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the NRHP or could cause loss or destruction of significant scientific, cultural, or historical resources.
9. The degree to which the action could adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.
10. Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment.

Mitigation to reduce possible project effects are embedded as part of Foresight's Proposed Project and Western's proposed switchyard and include Forest Service measures that would be implemented on Forest Service-managed lands for the proposed transmission tie-line and switchyard. The mitigation includes the RPMs in Table 2.7-1. Foresight, Forest Service, and Western committed to this mitigation prior to the evaluation of environmental impacts.

After discussion of impacts by resource section, this chapter also addresses Short-term Uses and Long-term Productivity, Unavoidable Adverse Effects, and Irreversible and Irretrievable Commitments of Resources. A discussion of Cumulative Impacts for the project is provided in Chapter 4.

3.1 LAND USE

3.1.1 Affected Environment

3.1.1.1 Resource Evaluation Area

The land use evaluation area includes the proposed wind park and primary access routes, the proposed transmission tie-line right-of-way, and the proposed Western switchyard, as well as a two-mile buffer extending beyond each of these three components. This two-mile buffer is the distance within which existing or proposed land uses could be directly or indirectly affected by the proposed project components, considering the location and height of the WTGs, and the level of noise expected during construction, operation, and maintenance of the wind park, transmission tie-line, and switchyard.

3.1.1.2 Characterization

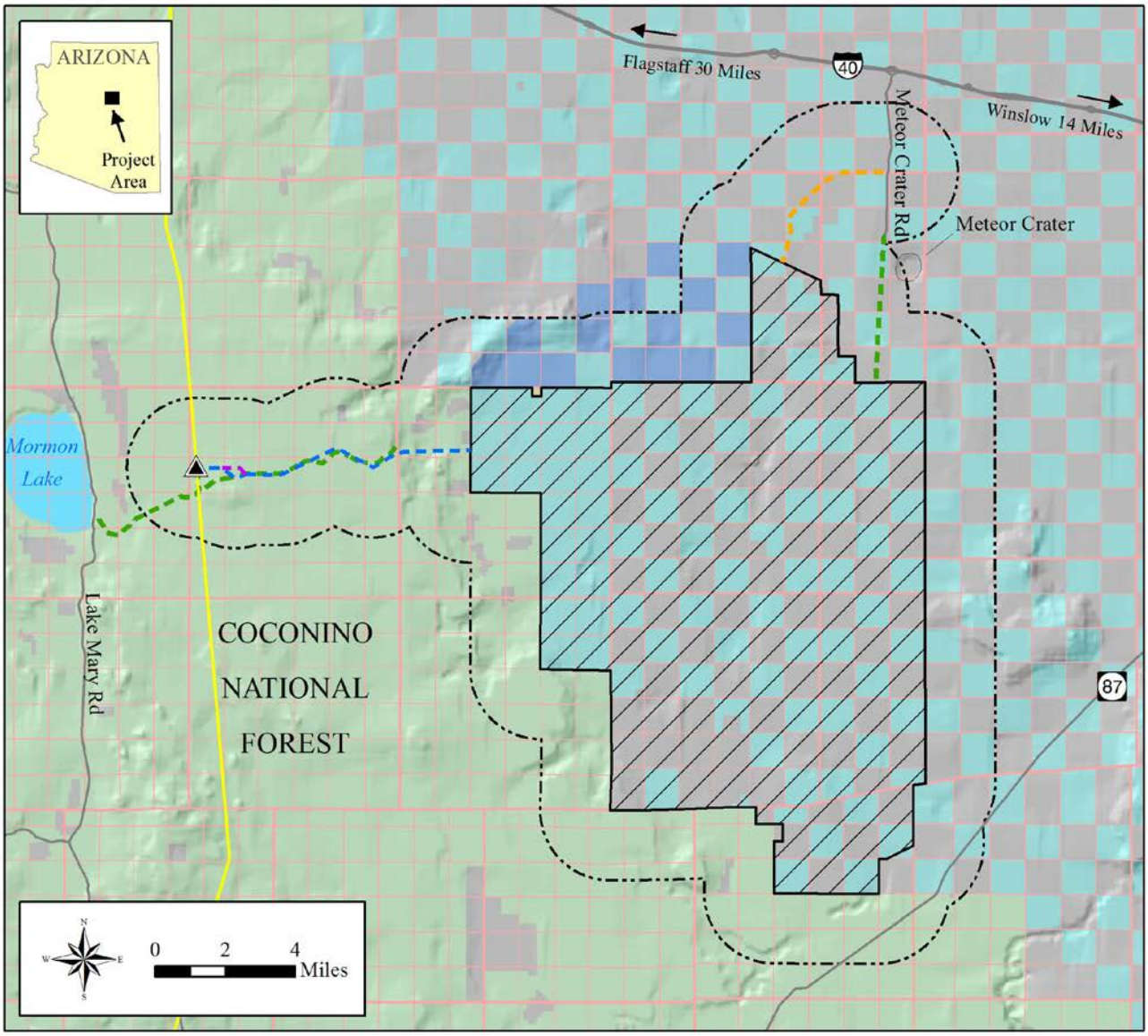
Information was collected for the land use evaluation area on land ownership and jurisdiction, existing land use, zoning, and planned land uses. Inventoried data were gathered through aerial photograph interpretation, field verification, and review of various documents including the Coconino County Comprehensive Plan, Coconino County Zoning Ordinance, Coconino National Forest Plan, and Diablo Canyon Rural Planning Area (RPA), a 2005 amendment to the Coconino County Comprehensive Plan. In addition, jurisdictional websites were accessed for information, and discussions were held with agency staff.

Land Ownership and Jurisdiction

Land ownership and jurisdiction depicts the limits of administrative or jurisdictional control maintained by the major landholders located in the vicinity of the proposed project components (Figure 3.1-1). Land status designations are important to the siting of wind parks, transmission lines, switchyards, and related access roads because they influence or directly determine such things as expenditure of management funds, land use and zoning regulations, and administrative planning goals for particular parcels or districts.

The private and State trust lands within the land use evaluation area fall under the jurisdiction of Coconino County. The private lands are owned by the Flying M Ranch and the Bar T Bar Ranch, and the State trust lands are administered by the ASLD.

Flying M Ranch is a combination of a number of historic homesteads which were purchased over the years by the Metzger family, with its first claim filed on Anderson Mesa in 1914. The ranch covers approximately 90,000 acres, a quarter of which is located on private land, and the remainder of which consists of Forest Service grazing allotments and ASLD grazing leases.



Legend

- Land Use Evaluation Area
- Wind Park Study Area
- Alternative 345-kV Tie-line Alignment
- Proposed 345-kV Tie-line-Alignment
- Proposed New Site Access Road
- Existing Site Access Road
- Proposed Interconnection Switchyard
- Existing Western 345-kV Transmission Lines
- Arizona Game and Fish Department
- Bureau of Land Management
- Coconino National Forest
- Private
- State Trust

Land Ownership and Jurisdiction

Grapevine Canyon Wind Project

FIGURE 3.1-1

The land that comprises Bar T Bar Ranch has been acquired from several ranches by the Tremaine and Chilson families since as early as 1913. Bar T Bar extends across approximately 326,200 acres. The ranch is located on private land, ASLD grazing leases, and Forest Service grazing allotments. Bar T Bar Ranch is now in its third generation of ownership and operation by the Chilson family.

Lands administered by ASLD are scattered throughout the land use evaluation area and typically have grazing leases. A portion of these lands, external to and north of the wind park study area, make up the Raymond Ranch Wildlife Area. The Raymond Ranch Wildlife Area is managed by AGFD. The ranch was acquired by AGFD in 1942 and is 14,637 acres in size, of which 9,438 acres are owned in fee and the remainder are leased from ASLD for grazing. Initially the AGFD operated ranch was managed to provide Winter range to the pronghorn antelope. However in 1945, a small herd of bison was introduced to the ranch and the management objectives of the ranch were expanded to include these animals. Today, the ranch provides range for many species of big game and the management objectives have continued to evolve. Currently the grazing of livestock is prohibited on all lands operated as part of the Raymond Ranch Wildlife Area.

In addition, Federal lands are located within the land use evaluation area, generally west of the proposed wind park study area. The vast majority of Federal land within the land use evaluation area is under the jurisdiction of the Forest Service. Forest Service-managed lands are administered for multiple uses. They are primarily used for grazing but also for dispersed uses such as recreation, hunting, and other forest management activities. An isolated parcel of land, approximately 40 acres in size, is under the jurisdiction of the U.S. Department of the Interior, Bureau of Land Management (BLM), Hassayampa Field Office, and is located external to and just north of the wind park study area.

Existing Land Use

Developed land use within the land use evaluation area is limited to a few scattered residences, outbuildings, corrals, and limited commercial development. The closest residences are located near the northwest corner of the wind park study area, which is the location of the Flying M Ranch Winter headquarters. The vast majority of the land use evaluation area, including Federal and State trust lands, is used primarily for grazing (Figure 3.1-2). Some of these lands are also used for recreation.

Two commercial developments are located near the land use evaluation area. Meteor Crater, an impact crater created by a meteorite approximately 50,000 years ago (Meteor Crater Enterprises, Inc), is located approximately two miles external to and northeast of the wind park study area (Figure 3.1-3). Meteor Crater Enterprises, Inc. operates a museum, gift shop, and fast-food restaurant near the north rim of the crater. In addition, Meteor Crater Enterprises, Inc. operates another development located at the Meteor Crater Road exit, south of I-40. The development includes a recreational vehicle (RV) park, convenience market with gas sales, and a fast-food restaurant. Business offices for Meteor Crater Enterprises, Inc. are also located in this development.

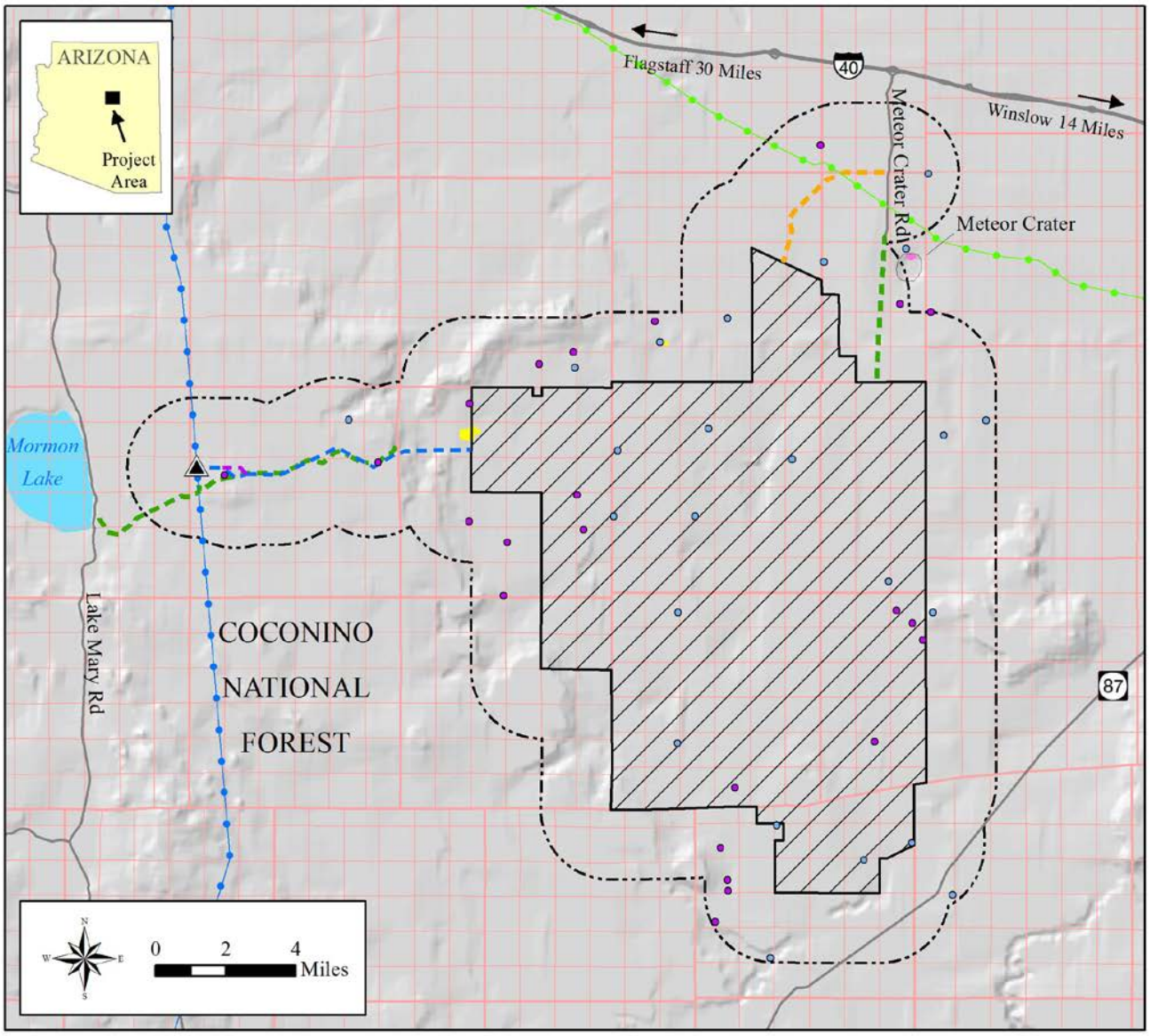
Other land uses within the land use evaluation area include roads, electrical and natural gas transmission lines, and a number of livestock tanks and wells. The Glen Canyon-Pinnacle Peak 345-kV transmission lines, operated by Western, are located approximately seven miles west of the wind park study area. The transmission lines travel in a north-south direction and are supported by steel lattice towers. These lines carry electricity from Glen Canyon Power Plant on the Colorado River and the Navajo Generating Station near Page, Arizona to the metropolitan Phoenix area. Western's proposed switchyard would interconnect with these transmission lines for the proposed wind park. Existing land uses are shown in Figure 3.1-4.

FIGURE 3.1-2

Open range land on Anderson Mesa within the land use evaluation area (transmission tie-line).

FIGURE 3.1-3

Meteor Crater located north and east of the wind park study area is over 4,000 feet across and 570 feet deep. The crater, privately owned by Meteor Crater Enterprises, has been a popular tourist attraction since the early 1900s.



Legend

- Land Use Evaluation Area
- Wind Park Study Area
- Alternative 345-kV Tie-line Alignment
- Proposed 345-kV Tie-line Alignment
- Proposed New Site Access Road
- Existing Site Access Road
- Proposed Interconnection Switchyard
- Commercial
- Residential
- Well
- Livestock Tank
- Existing Western 345-kV Transmission Lines
- Gas Pipeline

Existing Land Use

Grapevine Canyon Wind Project

FIGURE 3.1-4

Agriculture and Grazing

There are no agricultural lands actively under cultivation and no lands are classified as prime farmland by the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) within the land use evaluation area.

Livestock grazing, especially cattle grazing, is the dominant land use and occurs throughout the majority of the land use evaluation area on Federal, State trust, and private lands. Livestock grazing is authorized on lands administered by the Forest Service and ASLD by permit only. Permits are issued over a specified length of time for a specific unit of land, referred to as a grazing allotment on Federal land and a grazing lease on State trust land. Grazing allotments on Forest Service-managed lands are expressed in terms of total animal unit months (AUMs), and grazing leases on State trust land are expressed in animal units (AUs). An AU is defined as one mature (1,000 lb.) cow or the equivalent based on an average consumption rate of 26 pounds of forage dry matter per day, and one AUM is the amount of forage required by an AU for one month, or the tenure of one AU for a one-month period. Grazing allotments and leases within the land use evaluation area, including acres and AUMs/AUs specific to each unit, are depicted Figure 3.1-5.

Recreation

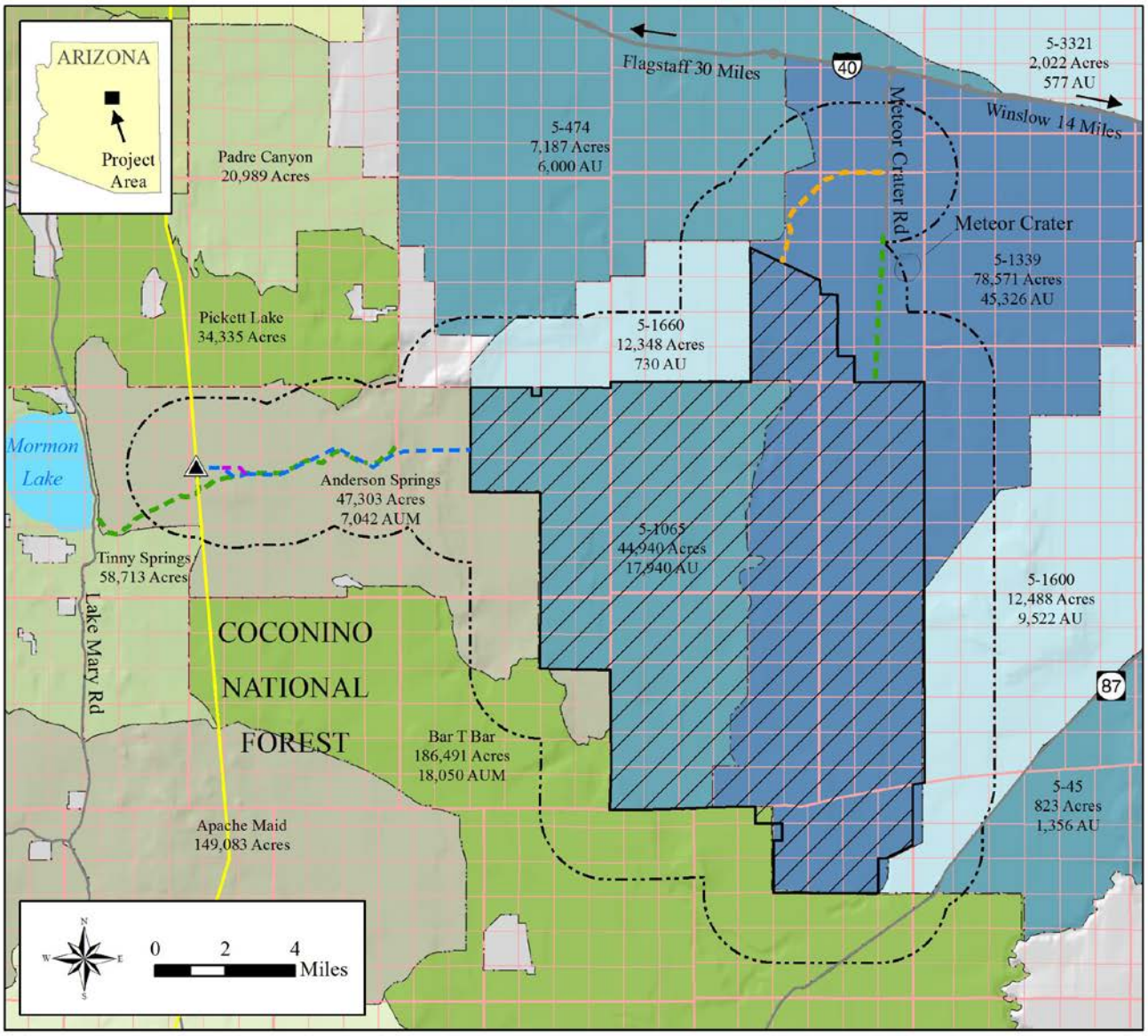
Federal lands are considered public. Public lands under the jurisdiction of the Forest Service and BLM are managed for multiple uses, including recreation. Forest Service-managed lands within and surrounding the land use evaluation area offer a variety of recreation opportunities including boating, swimming, fishing, camping, all-terrain vehicle use, picnicking, hiking, rock climbing, horseback riding, mountain biking, and hunting. Recreation in the vicinity of the proposed transmission tie-line is mostly dispersed in nature and includes camping in the Pine Hill area, located toward the western end of the proposed transmission tie-line and alternative (Figure 3.1-6). Jacks Canyon, considered one of the best sport climbing locations in the country, is located just south of the wind park study area (Figure 3.1-7).

Although State trust lands managed by ASLD are not considered public land, the opportunity for dispersed recreation on these lands is available within the land use evaluation area, but requires a permit.

The AGFD-managed Raymond Ranch Wildlife Area, located just north of the wind park study area, is open to camping, hunting (in season), and wildlife viewing.

Hunting in the State of Arizona is regulated by the AGFD, which mandates hunting season dates, legal wildlife, the number of permits authorized, and licensing fees. All valid hunting licenses are also issued by the AGFD. Hunting is permitted within the land use evaluation area, subject to Federal and State regulation, local ordinances, and seasons. Hunting is allowed on State trust lands through a recreation permit and on private land with permission from landowners.

Big and small game hunting currently occurs throughout the land use evaluation area. This area sits within the AGFD's Game Management units 5A and 5B, managed by the Flagstaff regional office. Figure 3.1-8 depicts the location of these management units with respect to the land use evaluation area. Game species include antelope, band-tailed pigeon, black bear, cottontail rabbit, deer (mule and white-tailed), elk, Merriam's turkey, mountain lion, tree squirrel, and waterfowl. Hunting seasons vary by species, but generally occur between the months of August and December. Hunts for big game species are issued on a draw basis and are generally limited to one animal of each species type, per hunter, per calendar year. The number of tags per Game Management Unit varies by year and species and is determined by AGFD.



Legend

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- Wind Park Study Area
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- Proposed 345-kV Tie-line-Alignment
- Proposed New Site Access Road
- Existing Site Access Road
- Proposed Interconnection Switchyard
- Existing Western 345-kV Transmission Lines
- Federal Grazing Allotments
- State Land Grazing Leases

Grazing Leases and Allotments

Grapevine Canyon Wind Project

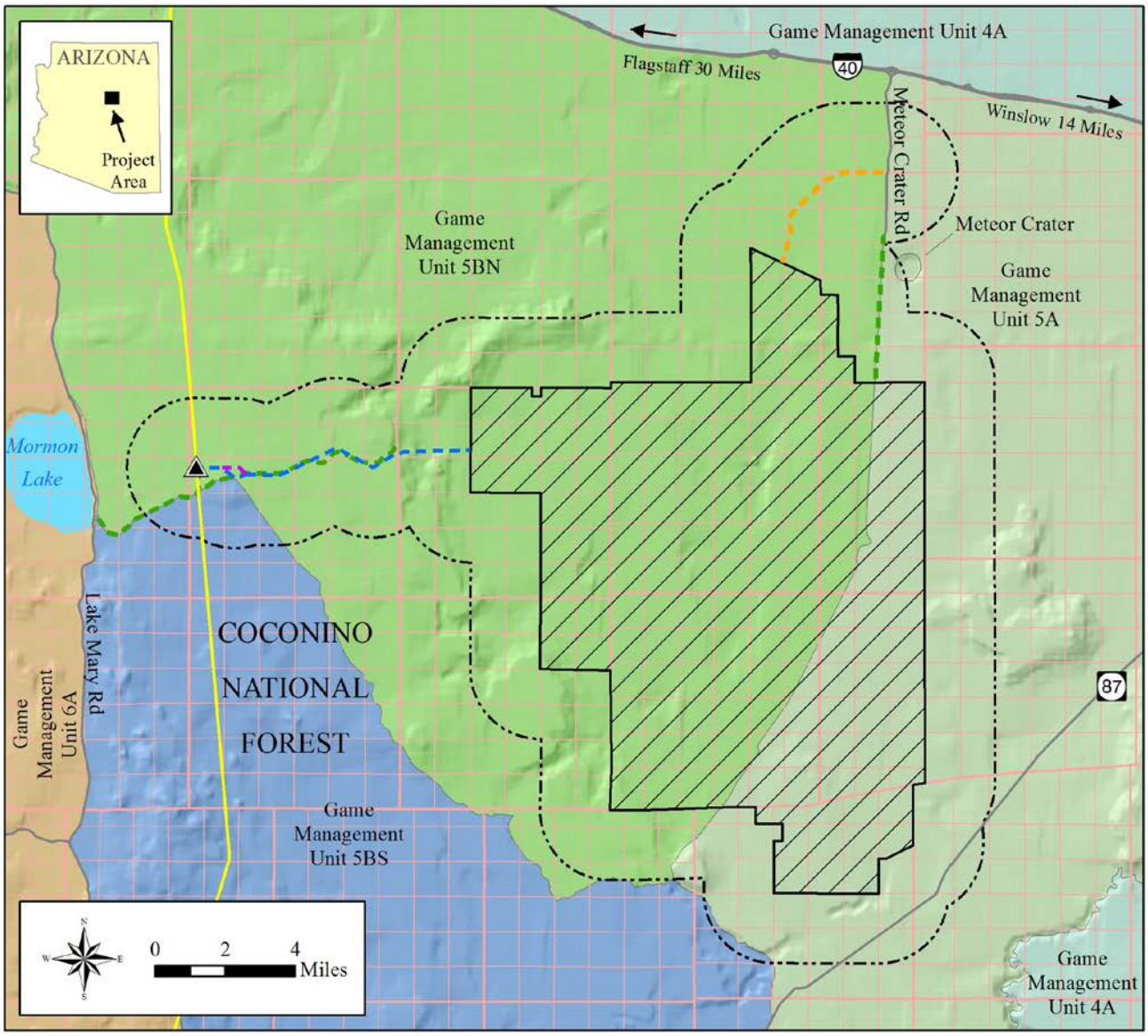
FIGURE 3.1-5

FIGURE 3.1-6

Anderson Mesa, located within the land use evaluation area (transmission tie-line), on the Coconino National Forest. The foreground shows FS 125, and Pine Hill is shown in the background on the left.

FIGURE 3.1-7

Jack's Canyon located just south of the wind park study area.
Source online at http://farm1.static.flickr.com/193/444408908_8ef56fc300.jpg.



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- Proposed New Site Access Road
- Existing Site Access Road
- Proposed Interconnection Switchyard
- Existing Western 345-kV Transmission Lines
- Game Management Unit 4A
- Game Management Unit 5A
- Game Management Unit 5BN
- Game Management Unit 5BS
- Game Management Unit 6A

Arizona Game and Fish Department Game Management Units

Grapevine Canyon Wind Project

FIGURE 3.1-8

Zoning

Zoning is the single most commonly used legal device for implementing a land use plan or for controlling the type of development within a given area. Zoning is an exercise of police power. This police power resides with the Arizona State government whose purpose is to promote the health, safety, and general welfare of the community. Most State legislatures delegate the power of zoning to local governments, and this is true of Arizona as well. The source of statutory authority for the Zoning Code is in the form of the State enabling act. Specifically, this authority is granted to counties from the Arizona Revised Statute (ARS) Title 11. Section 11-821 allows for the creation of county zoning regulations and county zoning districts, Section 11-829 authorizes rezoning and zoning code amendments for counties, and Section 11-808 gives the Zoning Inspector authority for zoning enforcement and interpretation.

All privately owned land and State trust land within the land use evaluation area is located within the jurisdiction of Coconino County and is zoned G (General – 10 Acre Minimum). This zoning district is a general rural land use category intended for application to those unincorporated areas of the County with parcels of ten acres or more not specifically designated in any other zone classification. Only those uses that are complementary and compatible with a rural environment are permitted, including very low density residential development, as well as agricultural-related uses. Certain uses, including wind turbines and other utilities, are possible in this zone with the approval of a Conditional Use Permit.

Applicable Land Use Plans

Coconino National Forest Land Management Plan

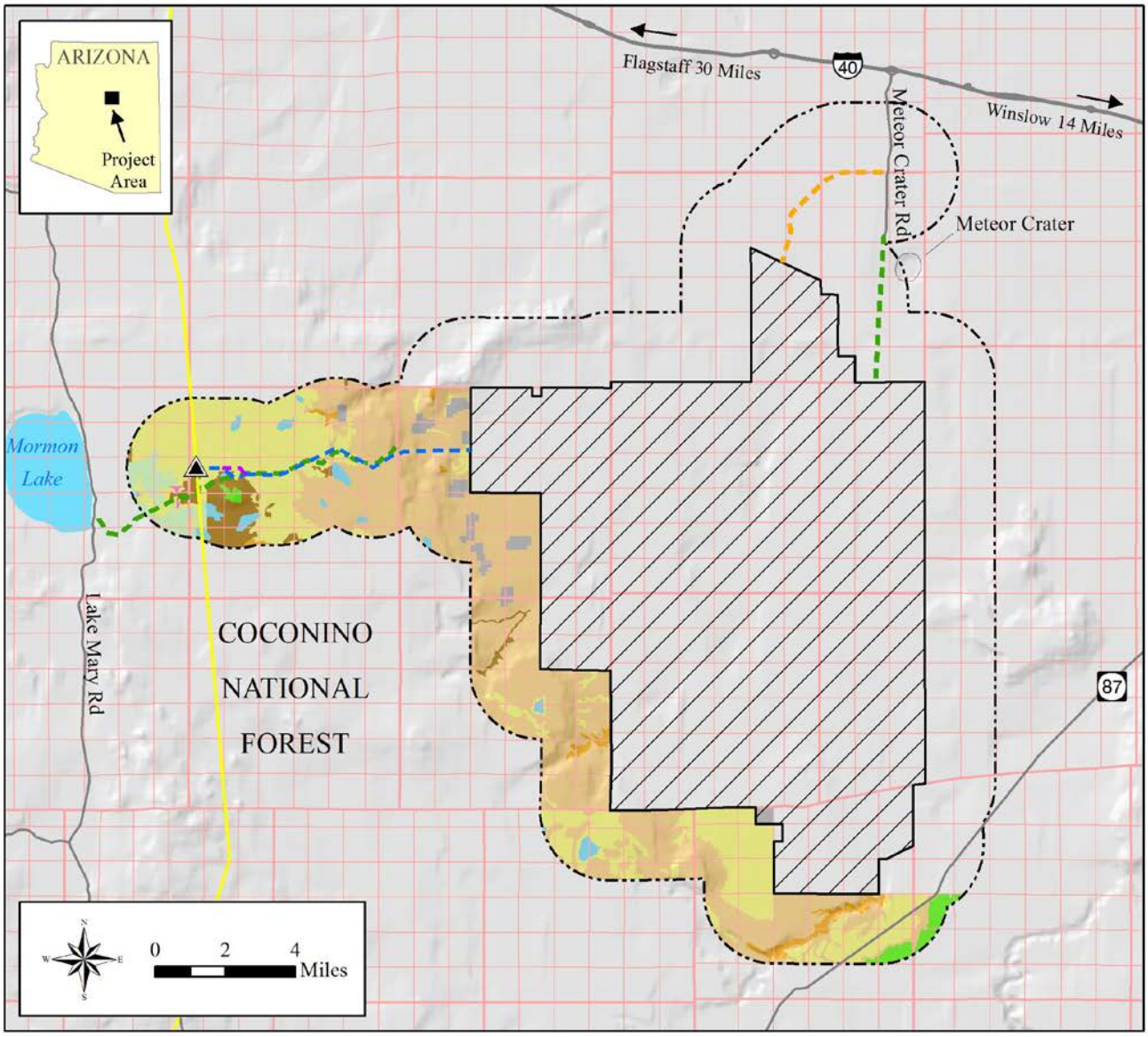
The Coconino National Forest Land Management Plan provides guidance on electrical transmission corridors. The Forest Plan explains that requests for electrical transmission corridors should be based on public need, economics, and environmental impacts. Utility corridors are managed to maintain resource conditions to the extent possible.

The proposed and alternative transmission tie-line and the proposed switchyard are subject to the Forest Plan. The Forest Plan does not prohibit the occurrence of the facilities on National Forest System lands, but requests that existing corridors be used whenever possible. Further, the Forest Plan states that when a new corridor is determined necessary it should be sited to avoid wilderness areas, Research Natural Areas, geological and botanical areas, the Elden Environmental Study Area, ponderosa pine and mixed conifer vegetation types, and impacts to threatened and endangered species.

The land use evaluation area is located within eight Management Areas (Figure 3.1-9). The proposed Western switchyard is located within Management Area 10 (Pinyon-juniper Woodland), and the proposed and alternative transmission tie-line traverses Management Areas 7 (Grassland and sparse Pinyon-juniper) and 10. The wind park study area does not fall within any Management Areas, since it is not located on National Forest System lands. In general, guidelines for these Management Areas promote wildlife habitat, particularly for indicator species; watershed condition; livestock grazing; and well-planned use of natural resources (e.g., timber, and maintenance and protection of scenic quality) (Forest Service, Southwestern Region 1987).

Coconino County Comprehensive Plan and Diablo Canyon Rural Planning Area

The Coconino County Comprehensive Plan is the document that guides the County on a course of action to manage growth, preserve the quality of life, and ensure sustainability. The ultimate goal of the plan is to present one document that reflects a County-wide consensus and ensures a coordinated effort between incorporated cities and towns; Federal, State, Native American, and regional agencies; and public/private service providers. Additionally, this plan aims to meet required State law "to conserve the natural resources of the County, to insure efficient expenditure of public funds, and to promote the health, safety, convenience, and general welfare of the public."



Legend

- Land Use Evaluation Area
- Wind Park Study Area
- Alternative 345-kV Tie-line Alignment
- Proposed 345-kV Tie-line Alignment
- Proposed New Site Access Road
- Existing Site Access Road
- Proposed Switchyard
- Existing Western 345-kV Transmission Lines
- Management Area 3 - Ponderosa pine and mixed conifer on less than 40% slope
- Management Area 4 - Ponderosa pine and mixed conifer on greater than 40% slope
- Management Area 6 - Unproductive timber lands
- Management Area 7 - Pinyon-juniper woodlands on less than 40% slope
- Management Area 8 - Pinyon-juniper woodlands on greater than 40% slope
- Management Area 9 - Mountain grasslands
- Management Area 10 - Transition grassland and sparse pinyon-juniper above the Mogollon Rim
- Management Area 12 - Riparian and open waters
- Private Land

Coconino National Forest
Resource Management Areas
Grapevine Canyon Wind Project

FIGURE 3.1-9

The County looks at Federal and State trust lands as open space. Open space is "primarily undeveloped land that provides scenic, ecological, or recreational values." The County's goal is to "ensure the preservation of open space." Additionally, the Comprehensive Plan lists the goal for utility services and corridors as "Promote the installation of utilities in a manner compatible with community character, scenic resources, and ecological integrity," and a policy that "Utilities infrastructure shall be located in a manner sensitive to environmental and scenic resources." Transmission lines over 115-kV are exempt from local jurisdiction.

Private lands within the land use evaluation area are located entirely within several large ranches. A Comprehensive Plan goal is to "preserve working ranches, unfragmented landscapes, and the County's natural character." In order to accomplish this goal, an additional method for long-term planning has been provided through the use of a RPA. One such RPA has been created within the land use evaluation area, the Diablo Canyon RPA which was a 2005 amendment to the Coconino County Comprehensive Plan (Figure 3.1-10).

The idea of an RPA was created by statute to provide a means of preserving traditional ranches for conservation. Specifically, the statute states that an RPA is an area created by a petition of owners of a majority of the property to prepare a plan that emphasizes voluntary, non-regulatory incentives for accommodating the continuation of traditional rural and agricultural enterprises as designated by the Board of Supervisors under ARS §11.806.D.3.

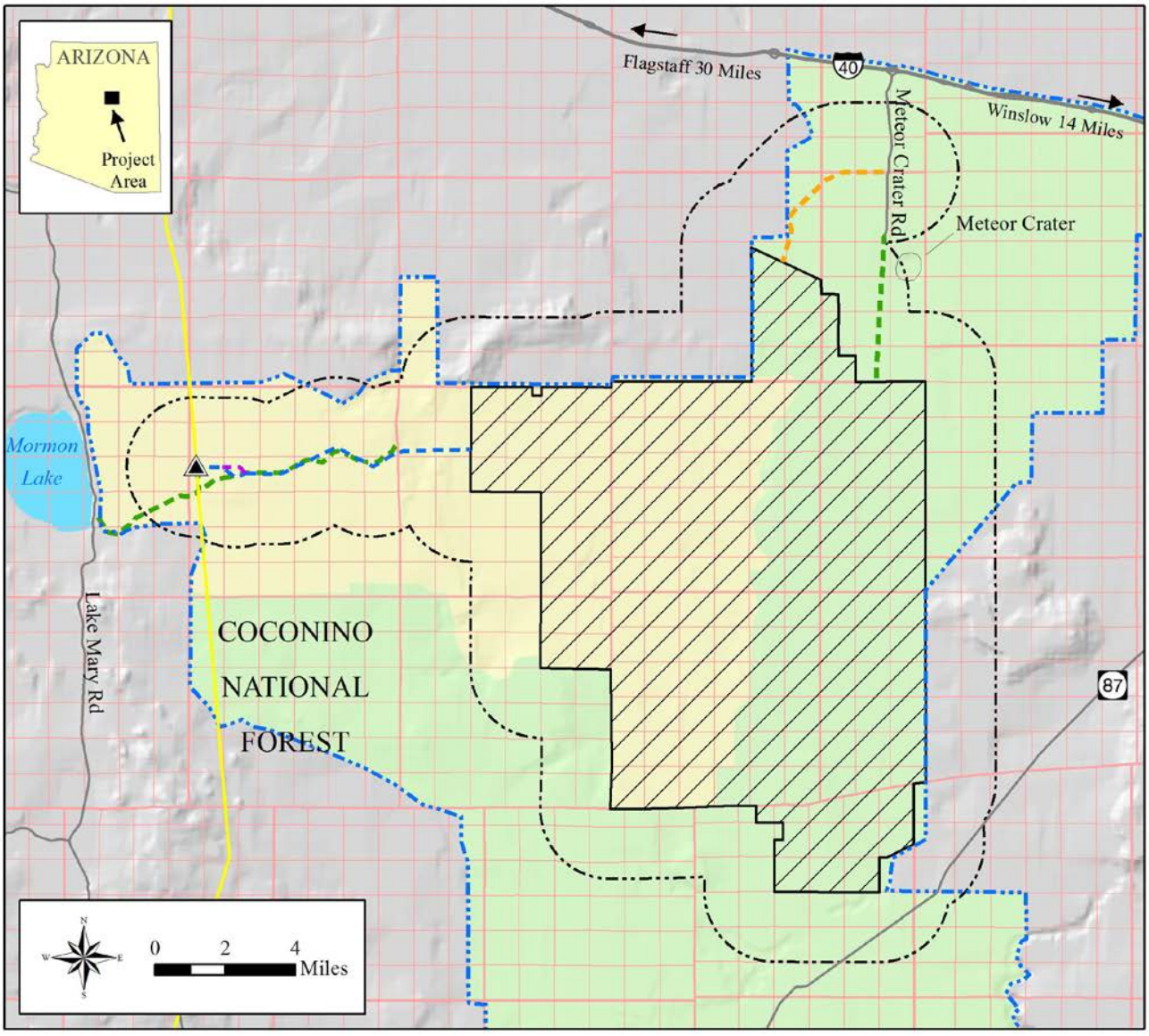
The Diablo Canyon RPA was established by the Coconino County Board of Supervisors on March 11, 2003, at the request of the Bar T Bar and Flying M Ranches, whose grazing leases and allotments are incorporated into the plan area (Figure 3.1-10). The final plan was approved by the Coconino County Board of Supervisors on August 16, 2005, and adopted as an amendment to the Coconino County Comprehensive Plan. The primary objectives of the Diablo Canyon RPA are to maintain historic ranching operations and address various economic opportunities as possible alternatives to supplement the cost of ranching and various range improvements.

Economic opportunities identified by the Diablo Canyon RPA include: 1) value added beef; 2) tourism, recreation, and education; 3) wood products; 4) energy development; 5) housing; 6) land protection options; and 7) other ideas to consider.

Specifically, the goal of the Diablo Canyon RPA with respect to energy development is to "facilitate the development of alternative energy projects while maintaining the integrity of the ranches and preserving aesthetics and views." Two forms of alternative energy production were considered in detail, including biomass and wind. Wind has been studied in Coconino County for the past several years. The studies identified several sites throughout the County with potential wind resources sufficient to justify a wind park, including the majority of the Diablo Canyon RPA.

Proposed Land Use

There are no other proposed developments within the land use evaluation area (Coconino County Community Development Department 2009). Regionally proposed projects include the Sunshine Wind Park, located just north of the wind park study area. The Sunshine Wind Park includes approximately 40 state-of-the-art wind turbines that would provide 60 MW of generating capacity, enough electricity to serve the average annual electricity needs of more than 14,000 homes. This project received a Conditional Use Permit from Coconino County in early 2005 for the construction of up to 40 turbines. The project would advance pending a power purchase agreement (Sunshine Wind 2009).



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- Existing Site Access Road
- Proposed Interconnection Switchyard
- Existing Western 345-kV Transmission Lines
- Diablo Canyon Rural Planning Area
- Bar T Bar Ranch
- Flying M Ranch

Diablo Canyon
Rural Planning Area

Grapevine Canyon Wind Project

FIGURE 3.1-10

In addition, several meteorological (met) towers have been installed throughout Coconino County, used to gather wind data necessary for the site evaluation and development of wind energy projects. Locations of the towers, and the associated owners, include the following:

- Sempra Energy has seven met towers and is negotiating a lease agreement with the Navajo Nation. Sempra has been working with the Cameron Chapter of the Navajo Nation for more than two years on developing a 500 MW wind power plant on Gray Mountain near Cameron, Arizona. Sempra has filed for interconnection into the Moenkopi-Eldorado Transmission Line and has begun the environmental and cultural monitoring that will be required by the Navajo Nation and the NEPA process. This project has been delayed and a project start date has not been identified.
- Northern Arizona University has been monitoring wind power since 2005 at several locations—five met towers at Aubrey Cliffs and one at Aubrey Valley near Seligman, Arizona; two met towers on Babbitt Ranches; and two met towers at Gray Mountain.
- Boquillas Wind has permits for five met towers at Aubrey Cliffs near Seligman, Arizona, on the Big Boquillas Ranch operated by the Navajo Nation. The Big Boquillas Ranch is comprised of intermingled State trust lands and private lands owned in fee simple by the Navajo Nation.

The County Community Development Department was not aware of any other proposed projects, including large-scale residential or commercial developments, within 25 to 30 miles of the land use evaluation area.

3.1.2 Environmental Consequences

3.1.2.1 Standards of Significance

Within the land use evaluation area, the following types of potential land use impacts are considered significant if Foresight's Proposed Project or the proposed Federal actions and alternatives would:

- Result in the loss of a residence or business structure.
- Create unresolved conflict with existing utility rights-of-way.
- Permanently remove acres of land from grazing to the point it affects the economic viability of the ranching operation.
- Cause major conflicts to established recreational areas.
- Eliminate, or severely curtail, the opportunity for hunting in the area.
- Conflict with adopted land use plans and goals of the community or area in which they are located, including open space designations, game management areas, or other types of areas designated for preservation.

3.1.2.2 Foresight's Proposed Project and Proposed Federal Actions

Wind Park

Land Ownership and Jurisdiction

The wind park study area would be located entirely on private and State trust land, under the jurisdiction of Coconino County. Lease agreements would be negotiated between the landowners and Foresight, including a long-term right-of-way from ASLD. These leases would allow construction and operation of the wind park over a negotiated term. In exchange, each landowner, including the Flying M Ranch, Bar T Bar Ranch, and ASLD would receive financial compensation on an annual basis.

Existing Land Use

The proposed wind park would be located on largely undeveloped land used for grazing. Existing residences and other ranch structures are located just outside of the wind park study area and would not be directly affected by project implementation. A buried natural gas pipeline is located within the wind park study area. Wind turbines would be placed outside of the pipeline right-of-way, and no impacts to the pipeline would be expected. The proposed wind park would not cause any unresolved conflicts with any other utility right-of-way, and listed land use significance standards listed in Section 3.1.2.1 would not be exceeded.

Grazing

Grazing is the predominant land use occurring throughout the wind park study area and would be allowed to continue as a compatible land use. The construction of the proposed wind park, if fully built out to 500 MW, would result in the temporary loss of 2,050 to 2,193 acres of grazing land, resulting in the temporary loss of approximately 1,010 to 1,080 AUs. With the proposed reclamation of disturbed areas not needed for permanent facilities, grazing land temporarily disturbed would return to production within approximately three years of the completion of construction activities. The placement of WTGs and access and service roads within the wind park study area would permanently remove 555 to 570 acres of land from grazing if fully built out to 500 MW, resulting in a permanent loss of approximately 273 to 281 AUs, less than one percent of the total for the wind park study area. More than 99 percent of the wind park study area would remain available to ranching, and the economic viability of the ranching operations would not be affected by the permanent removal of up to 570 acres of grazing land and the significance criteria related to grazing would not be exceeded.

Temporary and permanent acres of grazing land and the number of AUs that would be lost with the construction of the proposed wind park are shown in Table 3.1-1 arranged by ranch and ASLD lease number.

TABLE 3.1-1
SUMMARY OF THE EFFECTS OF THE 500 MW WIND PARK ON GRAZING

Ranch Name	Lease Number	Acreage within Wind Park	Total AUs within Wind Park	Temporary Land Disturbance[1] (%)	Temporary Grazing Impacts (AUs)[2]	Permanent Land Disturbance[1] (%)	Permanent Grazing Impacts (AUs)[2]
Flying M Ranch	5-1065	44,940	17,940	973-1,041 acres (2.2-2.3%)	389-415	263-270 acres (0.6%)	105-108
Bar T Bar	5-1339	49,742	28,695	1,077-1,152 acres (2.2-2.3%)	621-665	292-300 acres (0.6%)	168-173
TOTAL		94,682	46,635	2,050-2,193 acres (2.2-2.3%)	1,010-1,080	555-570 acres (0.6%)	273-281

[1] assume a proportionate distribution of land disturbance
[2] assume forage and capacity is even across all lands

Recreation

There would be no impacts to established, designated recreation areas. The proposed wind park would be located on a combination of private and State trust lands for which AGFD issues hunting permits. By law, no State trust lands can be closed to hunting or fishing without the consent of AGFD, and no person may lock a gate blocking access to these lands (ARS § 17-304 and Arizona Administrative Code R12-4-110). In the event it is determined that an area located on State trust lands should be closed to hunting during construction of the proposed wind park, Foresight would consult with the AGFD as required, and a temporary impact to hunting would occur. However, hunting is likely to be allowed throughout portions

of the wind park study area located on State trust land once wind park operations begin. Thus, long-term opportunities for hunting in the wind park study area are not expected to be severely curtailed or eliminated, and significance criteria related to recreation would not be exceeded.

Zoning

The proposed wind park is not a permitted use within the County's General zone. However, wind turbines could be allowed within the zone subject to approval of a Conditional Use Permit. Foresight would obtain this required permit from Coconino County prior to beginning construction on any portion of the proposed wind park. With the issuance of the Conditional Use Permit, there would be no conflict with existing land use plans.

Applicable Land Use Plans

The overarching goal of the Diablo Canyon RPA is to supplement ranching operations with additional economic opportunities that allow for continued operations of ranches within the RPA. The proposed wind park would be located entirely within the Diablo Canyon RPA and would be consistent with its adopted land use plans and goals. The proposed wind park is, in fact, a proposed land use that enhances the General Plan goals of economic development for rural areas, and therefore represents a positive influence for the area to continue as a viable economic community into the foreseeable future.

Transmission Tie-line

Land Ownership and Jurisdiction

The proposed transmission tie-line would be located on private, State trust, and National Forest System lands. An agreement would be made between the private landowners and Foresight to secure a lease or right-of-way easement for these lands. Additionally, a 200-foot right-of-way would be obtained from ASLD and the Forest Service for the use of these lands. Foresight would be responsible for the payment of fees required for the use of private, State trust, and Federal lands.

Existing Land Use

The proposed transmission tie-line is located within portions of an existing cattle trail and adjacent to portions of an existing roadway. The cattle trail extends from the Flying M Ranch Winter range (wind park study area) to the Summer range on top of Anderson Mesa. Short-term impacts during transmission tie-line construction could occur to cattle moving along this trail; however, this would be considered a minor impact because construction of the transmission tie-line would be scheduled to avoid conflicts with the limited timeframes in which cattle would use the trail. Long-term impacts to the cattle trail and movement of cattle between the Winter and Summer ranges would be minimal and could be beneficial because the transmission tie-line would create a wider area cleared of vegetation that could be used by the cattle.

Grazing

Grazing occurs throughout the transmission tie-line study area and would be allowed to continue once the transmission tie-line is constructed and operating. The construction of the transmission tie-line would result in the temporary loss of 345 to 413 acres of land and the permanent removal of 19 to 25 acres of land from grazing. Impacts to grazing would be distributed between the Anderson Springs Allotment and ASLD Lease No. 5-1065, both part of the Flying M Ranch. However, with the proposed reclamation of disturbed areas not needed for permanent facilities, grazing land temporarily disturbed would return to production within approximately three years of the completion of construction. This would result in a minimal loss of land available to grazing and would not affect the economic viability of the ranching operations. Therefore, the significance standard associated with grazing would not be met.

Recreation

The impacts to hunting and recreation from the construction and operation of the transmission tie-line across private and State trust lands would be the same as those associated with the proposed wind park. Temporary impacts to recreation uses, such as noise, traffic, diminished views, and closure of areas during construction on Forest Service-managed lands could occur during the construction of the transmission tie-line; however, hunting and other recreation uses would not be expected to be restricted on private, State trust, and Federal lands as a result of transmission tie-line operation, and significance thresholds associated with recreation would not be exceeded.

Zoning

The proposed transmission tie-line is not subject to local zoning requirements.

Applicable Land Use Plans

The proposed transmission tie-line is not located within a Wilderness Area, Research Natural Area, or the Elden Environmental Study Area, so would not cause direct land use impacts to these resources. The transmission tie-line would be consistent with the Forest Plan (the extent to which the transmission tie-line affects sensitive environmental resources is discussed under the Geology and Soils section and the Biological Resources section of this report). The proposed transmission tie-line is not subject to local jurisdictional authority as governed by the Coconino County Comprehensive Plan, but requires a CEC from the Arizona Corporation Commission. Foresight would obtain this certificate prior to beginning construction on any portion of the proposed transmission tie-line.

Western's Switchyard

Land Ownership and Jurisdiction

The proposed switchyard would be located on Federal land under the jurisdiction of the Forest Service, generally within the existing rights-of-way for the Glen Canyon-Pinnacle Peak transmission lines. Authorization for the use of lands for the proposed switchyard would be decided by the Forest Service.

Existing Land Use

The majority of the proposed switchyard would be located within the rights-of-way of the existing Glen Canyon-Pinnacle Peak transmission lines. Four additional towers would be added to the transmission lines to accommodate the interconnection, but neither the transmission lines nor their functions would be negatively affected by the modification. The switchyard would not create an unresolved conflict with existing utility rights-of-way, and land use significance standards would not be exceeded.

Grazing

The proposed switchyard is located within the Anderson Springs Grazing Allotment. Grazing occurs throughout the switchyard study area and would be allowed to continue once the switchyard is constructed and operating. The construction of the switchyard would result in the temporary loss of up to 24 acres of grazing land and the permanent removal of about 15 acres of land from grazing. This would result in a minimal loss of land available to grazing in the grazing allotment and would not affect the economic viability of the ranching operations and would not exceed the significance standards.

Recreation

Temporary impacts to recreation uses on Forest Service-managed lands would occur during the construction of the switchyard by limiting access to the construction area; however, hunting and other recreation uses would not be restricted on the Forest as a result of switchyard operation.

Zoning

The proposed switchyard is not subject to local zoning requirements.

Applicable Land Use Plans

The proposed switchyard is not located within a Wilderness Area, Research Natural Area, or the Elden Environmental Study Area, so it would not cause direct land use impacts to these resources. The switchyard would be located within an established utility corridor, consistent with the Forest Plan. Since the installation of the switchyard would be consistent with applicable land use plans, project impacts would be minimal and significance criteria would not be exceeded.

3.1.2.3 Alternative Transmission Tie-line Corridor

Impacts to land use associated with the construction and operation of the alternative transmission tie-line would be similar to those described for the proposed transmission tie-line. The alternative transmission tie-line would require the construction of a new access road over a distance of approximately three-quarter mile resulting in approximately one additional acre of temporary and permanent ground disturbance, slightly increasing the loss of land available for grazing. This new access road could lead to an increase in off-road recreation use on this particular portion of Forest Service-managed lands and could require that new access roads are signed or closed if illegal use becomes an issue. Potential land use impacts associated with the alternative transmission tie-line corridor would be minimal and would not exceed significance thresholds.

3.1.2.4 No Action Alternative

No direct impacts on existing or planned land uses or recreation opportunities would result through implementation of the No Action Alternative. Under this alternative, Western would not approve an interconnection for the Grapevine Canyon Wind Project, and the Forest Service would not issue a right-of-way for the transmission tie-line proposed for the wind park. The wind park, transmission tie-line, and switchyard would not be constructed and the land use and recreation resources of the area would remain unchanged.

3.2 BIOLOGICAL RESOURCES[2]

Biological resources within the evaluation area were evaluated through a search of existing data, including published literature, field guides, public data sets, and site visits. In addition, the USFWS, AGFD, and the Forest were contacted concerning the presence of sensitive species and habitats within the evaluation area. The Forest Service sensitive species lists for plants and wildlife were used for analysis of the transmission tie-line and switchyard portion of the project. Due to issues raised in scoping, raptors, bats, and big game species have been addressed individually. Biological concerns for development of commercial wind energy facilities has generally centered on collision risk of birds and bats with wind turbines, indirect effects due to habitat loss or alteration, and direct and indirect impacts to sensitive species (NAS 2007; Strickland et al. 2011).

This chapter relies on the following information sources: 1) habitat and biological evaluations conducted in 2009 by Western EcoSystems Technology, Inc. (WEST) (Tidhar and Chatfield 2010a, 2010b); 2) baseline avian and bat studies conducted on a large portion of the proposed wind park between 2007–2008 (Young et al. 2009) and during 2011 (Tidhar et al. 2011a, 2001b) and; 3) bird and bat study results

[2] The Biological Resources section was reorganized in the Final EIS and new content added, to respond to public comments received on the Draft EIS. New content has been marked with a vertical line in the left margin of the Final EIS. Text that has been moved is not indicated with a line in the left margin because it is not new or revised text.

from the nearby proposed Sunshine Wind Energy Project (WEST 2006; Gruver et al 2009). The Sunshine Wind Energy Project is located close to the wind park study area, contains similar species composition and habitats, and was studied using similar pre-construction survey methods. For the biological resources section, the wind park study area has been divided into three separate sub-study areas: Sub-study Area A, Sub-study Area B, and Sub-study Area C. The biological resources evaluation is comprised of three separate reports: a Wildlife and Botanical Report (Tidhar and Chatfield 2010b) for the proposed transmission tie-line right-of-way and switchyard that would be sited on Forest Service lands; a Site Characterization Report (Tidhar and Chatfield 2010a) for the proposed Grapevine Canyon Wind Resource Area (referred to in this EIS as the wind park study area which was divided into Sub-study Area A, Sub-study Area B, and Sub-study Area C by WEST in the Site Characterization Report); and a baseline wildlife survey report conducted by WEST in 2007 and 2008 within Sub-study Area A of the wind park study area (Young et al. 2009). These reports are included in Appendices D.1, D.2, and D.3 of this EIS. These reports address land cover and habitats; the potential for sensitive plants and wildlife to occur; the potential for avian migratory pathways, important biological features such as raptor nests, prey populations, and other biological resources; and results from baseline wildlife surveys completed within Sub-study Area A in 2007–2008. The primary objective of the surveys was to generate data on seasonal and annual use by birds and bats that would be useful in evaluating impacts from the proposed wind-energy facility. AGFD, USFWS, Forest Service, and Western biologists have reviewed and commented on the evaluation contained in the reports. Correspondence from USFWS and AGFD related to the reports is found in the Site Characterization Report (Appendix D.1). Based on these comments, information from these reports has been used to prepare this section of this EIS. Comments received on the Draft EIS have also been incorporated into this section.

3.2.1 Affected Environment

3.2.1.1 Resource Evaluation Area

The biological resources evaluation area consists of the proposed wind park study area (including Sub-study Area A, Sub-study Area B, and Sub-study Area C), the proposed site access road, a two-mile buffer around the wind park study area and site access road, and a one-mile buffer around the transmission tie-line and switchyard study area (Figure 3.2-1). Information used to evaluate the wind park study area and two-mile buffer comes directly from the Site Characterization Report (Appendix D.1). Within the Site Characterization Report, the wind park study area and buffer was titled Grapevine Canyon Wind Resource Area, a term not used in this EIS. In addition, the Site Characterization report divided the wind park study area into three separate areas depicted as Study Areas A, B, and C, which have been re-titled for the EIS to Sub-study Areas A, B, and C to minimize confusion about the term "study area." Information to evaluate the proposed transmission tie-line and switchyard is derived from the Wildlife and Botanical Report (Appendix D.2) in which the evaluation area is described as the transmission tie-line alignment and switchyard and a one-mile buffer of the proposed transmission tie-line alignment and switchyard site. This biological resources evaluation area includes all infrastructure including, but not limited to, WTGs, underground and potentially overhead electrical collection lines, roads, step-up substations, operations and maintenance facility buildings, 345-kV transmission tie-line, and Western's interconnection switchyard.

3.2.1.2 Characterization

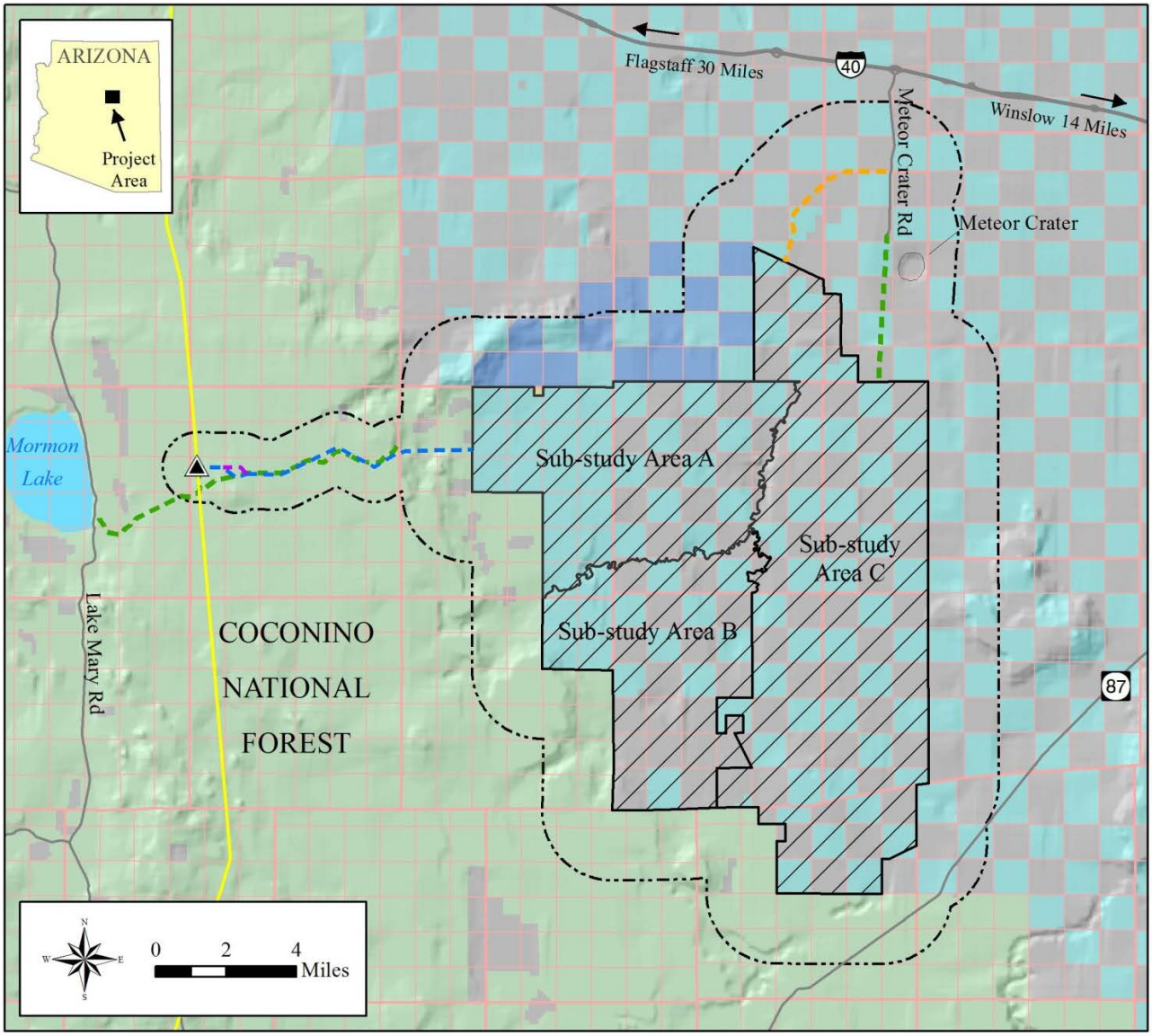
Environmental Setting

The biological resources evaluation area is located in the transition zone between the Arizona/New Mexico Plateau Ecoregion, which covers much of northern Arizona and northwestern New Mexico, and the higher elevation Arizona/New Mexico Mountain Ecoregion immediately to the west (EPA 2004).

The Plateau Ecoregion is a transitional region between the semiarid, low relief tablelands in the east; the drier, shrubland/woodland covered, higher relief tablelands in the Colorado Plateau; and the lower, hotter, less-vegetated Mojave Basin and Range in the east; and the Chihuahuan Desert in the south. Higher, more forested, mountainous ecoregions border the Arizona/New Mexico Plateau to the northeast and southwest. Vegetation communities in the region are characteristic of Great Basin shrublands and grasslands. Higher elevations within the region support pinyon pine (*Pinus edulis*) and juniper (*Juniperus* spp.) forests. Improper grazing management has caused widespread habitat degradation throughout much of the region. Lack of regular fires and high grazing pressure may have led to conversion of areas from native grassland to Great Basin desert scrub or Great Basin conifer woodland (AGFD 2006).

The Arizona/New Mexico Mountain Ecoregion lays immediately to the west of the existing Western 345-kV transmission lines. Chaparral is common on the lower elevation slopes of this ecoregion with pinyon-juniper and oak (*Quercus* spp.) woodlands found on lower and mid elevations and open to dense ponderosa pine (*Pinus ponderosa*) forests occur at higher elevations. Forests of spruce (*Picea* spp.), fir (*Abies* spp.), and Douglas fir (*Pseudotsuga menziensii*) are found in only a few high-elevation parts of the region and are not present within the evaluation area.

Topography within the evaluation area is generally very flat to gently sloping with the exception of a few low ridges and larger canyons with moderate to steep embankments or cliffs. The vast majority of the evaluation area is characterized by Great Basin shrubland and grassland. The vegetation transitions into areas of juniper savannah, pinyon-juniper woodland, and ponderosa pine forest as the western portion of the area extends onto the Anderson Mesa. Elevations range from approximately 5,410 to 7,480 feet above sea level.



Legend

- Evaluation Area
- Proposed Wind Park Study Area
- Alternative 345-kV Tie-line Alignment
- Proposed 345-kV Tie-line-Alignment
- Proposed New Site Access Road
- Existing Site Access Road
- Proposed Interconnection Switchyard
- Existing Western 345-kV Transmission Lines
- Arizona Game and Fish Department
- Bureau of Land Management
- Coconino National Forest
- Private
- State

Biological Resources Evaluation Area

Grapevine Canyon Wind Project

FIGURE 3.2-1

Land Cover

Land cover types for the biological resources evaluation area were analyzed using the USGS National Land Cover Database (NLCD) maps (USGS 2001) and site visits. The dominant cover types in the evaluation area are scrub-shrub and grassland. Other cover types include evergreen forest (comprised of ponderosa pine), woody wetlands, pinyon/juniper woodlands, barren land, cropland, pasture/hay fields, and developed open space. The evaluation area is based on the area included in the wind park study area for a potential project fully built out to 500 MW. Under that scenario, the evaluation area is approximately 123,355 acres of which the dominant cover type is scrub-shrub which comprises about 70 percent of the area. This land cover type comprises about 74 percent of the approximately 94,950-acre wind park study area. The only other major land cover type in the evaluation area and wind park study area is grassland, which comprises about 32,842 acres (18 percent) of the evaluation area and about 22,530 acres (24 percent) of the wind park study area. If the project is fully built out, then direct impacts to land (both permanent and temporary) would result in approximately 2,420 to 2,631 acres of land disturbance, which is less than 3 percent of the evaluation area.

According to NLCD maps, evergreen forest is primarily restricted to the northwest corner of Sub-study Area A of the wind park study area and along the western and southern boundary of Sub-study Area B. Land cover does not significantly differ among the three Sub-study areas of the project. Sub-study Area C is the largest of the three Sub-study areas, constituting approximately 49,470 acres, or 52 percent, of the overall wind park study area. Sub-study Area C contains slightly more grassland than the other Sub-study areas according to NLCD data. Sub-study Area A contains the largest amount of woody wetlands (about 69 acres) due to the greater proportion of canyons found within this area of the wind park study area as compared with Sub-study areas B or C.

The transmission tie-line right-of-way encompasses approximately 678 acres of which approximately 63 percent is grassland and 34 percent is pinyon-juniper woodland. The remaining area (less than three percent) is comprised of ponderosa pine forest. Plains grassland which covers the majority of the transmission tie-line alignment consists of a grass-forb association dominated by western wheatgrass (*Agropyron smithii*). Pinyon-juniper woodlands are composed of Utah juniper (*Juniperus osteosperma*) intermixed with varying amounts of pinyon pine. The proposed transmission tie-line transverses only a small amount of ponderosa pine habitat limited to two small areas in the western portion of the proposed transmission tie-line corridor and near the proposed Western switchyard. The areas of pine forest that would be impacted by the proposed transmission tie-line are located along the very edge of larger tracts of mature to intermediate-aged pure ponderosa pine forest to the south of the transmission tie-line. Habitat types found along the alternative transmission tie-line alignment are generally similar to those of the proposed transmission tie-line, except the alternative transmission tie-line alignment does not cross any ponderosa pine forests.

The access road is largely located within scrub-shrub and grassland typical of the surrounding area. Some scattered small rocky outcrops are sporadically located along or adjacent to the proposed route. The road crosses Diablo Canyon in a section of the canyon containing an existing natural crossing, in an area without natural canyon walls or large rock features. The crossing area is dominated by grassland and scrub-shrub vegetation common to the surrounding landscape. During a site visit conducted to assess the area in November 2009 no standing water nor perennial or ephemeral water features were evident.

Wetlands and Riparian Areas

Information on wetlands and waterbodies was obtained from National Wetland Inventory data USFWS 2004). Wetland delineations were performed in consultation with the USACE, and the appropriate Section 404 permit would be obtained prior to project construction. Anderson Mesa contains a network of small seasonal wetlands which contain water following periods of monsoon rainfall or Winter

snowfall, and provide habitat for a diversity of waterfowl and other wildlife and plant species. Several small lakes, including Pine Lake and Yaeger Lake, are present within the evaluation area. Larger waterways include Jack's Canyon, Canyon Diablo, Grapevine Canyon, and Yaeger Canyon. These canyons generally do not hold water year-round, although water is present in some canyon bottom locations year-round, indicating the presence of ephemeral springs. Livestock drinkers and earthen stock ponds are also present throughout the evaluation area, however, little to no natural wetland vegetation is present in these areas.

Invasive and Non-native Plant Species

The State of Arizona has laws addressing the control and eradication of noxious weeds and identifying specific species that fall under noxious weed definitions (A.A.C. R3-4-244 and 245). Noxious weeds and other non-native plant species typically associated with rangeland are currently found within the biological resources evaluation area. Noxious and invasive weeds are defined as "those plant species designated as noxious and invasive weeds by the Secretary of Agriculture or by the responsible state official." Noxious and invasive weeds generally possess one or more of the following characteristics: "aggressive and difficult to manage, poisonous or toxic, parasitic, a carrier or host of serious insects or disease, and being non-native or new to or not common to the United States or parts thereof" (Forest Service 1995a). Although the project area was not surveyed for noxious and invasive weeds, Scotch thistle, Russian knapweed, diffuse knapweed, bull thistle, and Dalmatian toadflax are likely to occur in the biological resources evaluation area.

Special Status Species

Special status plants and wildlife habitat and distribution information were reviewed and species were assessed for potential of occurrence within the biological resources evaluation area qualitatively along a scale ranging from no potential for occurrence ("none") to highest probability for occurrence ("high"). Rank classifications and definitions used for qualitative assessment for probability of occurrence are as follows (Tidhar and Chatfield 2010a and 2010b):

- None – No potential for occurrence. Known range and distribution do not overlap the project evaluation area. Potential habitat completely absent from the evaluation area. No species accounts for the evaluation area or surrounding area exist.
- Extremely Low – Extremely low probability of occurrence. Known range and distribution may not include the evaluation area. Very limited potential habitat is available within the evaluation area. No species accounts for the evaluation area or surrounding area exist.
- Low – Low probability of occurrence. Known range and distribution include the evaluation area. Potential habitat available patchily or in isolated areas within the evaluation area. No species accounts for the evaluation area or surrounding area exist.
- Moderate – Moderate probability of occurrence. Range and distribution include the evaluation area. Habitat present within the evaluation area. Species accounts for the evaluation area or surrounding area may exist.
- High – Highest probability of occurrence. Range and distribution overlap the evaluation area. Habitat abundant within the evaluation area. Species accounts exist for the evaluation area.

Special Status Plant Species

Federal- and State-listed plant species recorded for Coconino County within the biological resources evaluation area were obtained from the USFWS (2009b) and AGFD (2009h). The Forest Service list of threatened, endangered, and sensitive plant species for the Mormon Lake and Peaks Ranger Districts in the Forest was used to evaluate species for the transmission tie-line and switchyard elements on Forest land.

Threatened, Endangered, and Sensitive Plant Species (Wind Park)

The USFWS lists seven plant species designated as endangered, threatened, or candidate species with known or potential occurrence in Coconino County (Appendix D.1, Table 2.3). Additionally, the AGFD lists six plants as Federal species of concern and one Federally-listed threatened species as having documented presence at the watershed level within the Canyon Diablo and/or Middle Little Colorado Watersheds (Appendix D.1, Table 2.4), which encompass the biological resources evaluation area (AGFD 2009h). None of these plants have been documented as occurring within the wind park study area; however, it is possible that rare plant surveys have never been conducted in the area. Due to a very limited distribution and/or specific habitat requirements, only one species, the Peebles Navajo cactus (*Pediocaactus peeblesianus* var. *peeblesianus*) has a moderate potential to occur with Sub-study Areas A, B, and C. No other Federal threatened, endangered, or sensitive plant species are known to occur within or immediately adjacent to the wind park study area.

The AGFD also lists 16 State sensitive plant species with documented occurrence in the Canyon Diablo and/or Middle Little Colorado Watersheds. Of these 16, six species (blumer's dock [*Rumex orthoneurus*], gladiator milk-vetch [*Astragalus xiphoides*], Mogollon thistle [*Cirsium parryi mogollonicum*], paper-spined cactus [*Pediocactus papyracanthus*], Peebles Navajo cactus, and San Francisco Peaks groundsel [*Senecio franciscanus*]) are also listed as Federal threatened or endangered species or Federal species of concern by the USFWS. The Site Characterization Report (Appendix D.1) provides a list of all these species, as well as status, habitat information, and analysis of potential to occur. Other than the Peebles Navajo cactus, the wind park study area contains relatively low diversity, and due to a limited distribution and/or specific habitat requirements, the State-listed species are not expected to occur in the biological resources evaluation area.

Threatened, Endangered, and Sensitive Plant Species (Transmission Tie-Line and Switchyard)

The Forest Service has compiled a list of 14 threatened, endangered, and sensitive plant species for the Mormon Lake and Peaks Ranger Districts in the Forest. The Wildlife and Botanical Report (Appendix D.2, Table 3.2) provides a list of these species, as well as status, habitat information, and analysis of potential to occur within a one-mile evaluation area of the transmission tie-line and switchyard. Due to a very limited distribution, and/or specific habitat requirements, 13 of the species have no potential to occur within or immediately adjacent to the transmission tie-line alignment. One species has extremely low potential for occurrence (Flagstaff beardtongue [*Penstemon nudiflorus*]) within or immediately adjacent to the transmission tie-line alignment. Among the 14 sensitive plant species recorded within the Forest District, the Forest Service determined that suitable habitat is present only for Flagstaff beardtongue (Forest Service 2009). The proposed switchyard area does not contain suitable habitat for Flagstaff beardtongue.

Within the one-mile evaluation area, suitable habitat exists for four species: Arizona bugbane (*Cimicifuga arizonica*, Extremely Low), Arizona sneezeweed (*Helenium arizonicum*, Moderate), Arizona sunflower (*Helianthus arizonensis*, Extremely Low), Bebb's Willow (*Salix bebbiana*, Moderate). While there is moderate potential for Bebb's willow to occur within one mile of the transmission tie-line and switchyard, there is no potential for the species to be located immediately adjacent to the transmission tie-line and switchyard due to the absence of suitable habitat.

Special Status Wildlife Species

All Federal- and State-listed species recorded for Coconino County and/or considered by the USFWS (2009b) or AGFD (2009h) to have the potential for occurrence within the county were evaluated for the biological resources evaluation area (Appendix D.1 and D.2) and are summarized in Table 3.2-1. For classifications of potential for occurrence, AGFD maintains distribution lists for sensitive species at the

watershed level, and these data were also incorporated into the analyses. Classifications for birds include potential for occurrence for nesting as well as presence, while other wildlife was classified for presence. The Forest Service list of special-status wildlife species on the Mormon Lake and Peaks Ranger Districts in the Forest was used to evaluate species for the transmission tie-line and switchyard. This list includes Federal threatened, endangered, and candidate wildlife species; Arizona State wildlife of special concern; Forest Service sensitive wildlife species; Forest Service Management Indicator Species (MIS); and migratory birds. Species habitat and distribution information available from published reports and publicly available data sets were reviewed. Species were ranked for potential of occurrence using the same scale used for special status plant species.

TABLE 3.2-1
THREATENED, ENDANGERED, AND SENSITIVE WILDLIFE SPECIES
THAT MAY OCCUR IN THE BIOLOGICAL RESOURCES EVALUATION AREA

Species	Status[1]	Potential to Occur – Wind Park Study Area[A]	Potential to Occur – Transmission Tie-Line or Switchyard[B]
BIRDS			
American peregrine falcon *Falco peregrinus anatum*	FSC, WSC, SEN	Extremely Low (nesting) Moderate (presence)	None (nesting) Moderate (presence)
Bald eagle *Haliaeetus leucocephalus*	WSC, SEN, BGEPA	None (nesting) Low (presence)	None (nesting) Moderate (presence)
Belted kingfisher *Megaceryle alcyon*	WSC	None (nesting) Extremely Low (presence)	None (nesting or presence)
California condor *Gymnogyps californianus*	FE/ NE	None (nesting) Extremely Low (presence)	None (nesting or presence).
Clark's grebe *Aechmophorus clarkia*	WSC, SEN	None (nesting) Extremely Low (presence)	Moderate (nesting) Moderate (presence)
Ferruginous hawk *Buteo regalis*	WSC	Extremely Low (nesting or presence)	None (nesting or presence)
Golden Eagle *Aquila chrysaetos*	BGEPA	High (nesting) High (presence)	Low (nesting) Low (presence)
Mexican spotted owl *Strix occidentalis lucida*	FT/WSC/SEN	None (nesting) Extremely Low (presence).	None (Nesting), Extremely Low (Presence)
Northern goshawk *Accipiter gentilis*	FSC, WSC, SEN	Extremely Low (nesting) Low (presence)	Extremely Low (nesting) Moderate (presence)
Osprey *Pandion haliaetus*	WSC	None (nesting) Extremely Low (presence)	None (nesting) Extremely Low (presence)
Southwestern willow flycatcher *Empidonax traillii extimus*	FE	Extremely Low (nesting or presence)	None (nesting or presence).
Western yellow-billed cuckoo *Coccyzus americanus occidentalis*	FC	None (nesting) Extremely Low (presence)	None (nesting or presence).
MAMMALS			
Allen's lappet-browed bat *Idionycteris phyllotis*	FSC, SEN	High	High (presence)
Black-footed ferret *Mustela nigripes*	FE/NE	None	None
Greater western mastiff bat *Eumops perotis californicus*	FSC, SEN	None	High
Merriam's shrew *Sorex merriami leucogenys*	SEN	N/A	Low

TABLE 3.2-1
THREATENED, ENDANGERED, AND SENSITIVE WILDLIFE SPECIES
THAT MAY OCCUR IN THE BIOLOGICAL RESOURCES EVALUATION AREA

Species	Status[1]	Potential to Occur – Wind Park Study Area[A]	Potential to Occur – Transmission Tie-Line or Switchyard[B]
Navajo Mexican vole *Microtus mexicanus navaho*	WSC	Low	None
Navajo Mogollon vole *Microtus mogollonensis Navaho*	SEN	N/A	Low
Pale Townsend's big-eared bat *Corynorhinus townsendii pallescens*	FSC, SEN	None	Low
Spotted bat *Euderma maculatum*	FSC, WSC, SEN	None	Low
REPTILES			
narrow-headed gartersnake *Thamnophis rufipunctatus*	WSC	None	None
Northern Mexican gartersnake *Thamnophis eques megalops*	FC	None	None
AMPHIBIANS			
Chiricahua leopard frog *Rana chiricahuensis*	FT	None	None
Northern leopard frog *Rana pipiens*	WSC, SEN	None	Low
FISH			
Apache trout *Oncorhynchus apache*	FT	None	None
Humpback chub *Gila cypha*	FE	None	None
Little Colorado spinedace *Lepidomeda vittata*	FT, WSC	None	None
Little Colorado sucker *Catostomus* sp. *3*	WSC	Low	None
Razorback sucker *Xyrauchen texanus*	FE	None	None
Roundtail chub *Gila robusta*	FC	None	None
INVERTEBRATES			
Kanab ambersnail *Oxyloma haydeni kanabensis*	FE	None	None

[A]Within two miles of the wind park study area.
[B]Winthin one mile of the transmission tie-line and switchyard.
[1] FE = Federal Endangered; FT = Federal Threatened; FC = Federal Candidate; FSC = Federal Species of Concern; NE = Nonessential Experimental Population; WSC = Arizona State Wildlife of Special Concern; SEN = Forest Service sensitive species; BGEPA = Species protected by the Bald and Golden Eagle Protection Act.

Federal Threatened and Endangered Wildlife Species (Wind Park)

The Site Characterization Report (Appendix D.1, Table 3.3) provides a list of all the Federal threatened, endangered, and candidate wildlife species as well as status, habitat information, and analysis of potential to occur for the wind park study area, access road, and two-mile buffer. Thirteen wildlife species listed as endangered, threatened, candidate, or non-essential experimental special status species by the Federal ESA occur within Coconino County, Arizona, including four birds, one mammal, one reptile, one amphibian, five fish, and one snail. The majority of these species are not expected to occur in the wind park study area. The California condor (*Gymnogyps californianus*), southwestern willow flycatcher (*Empidonax traillii extimus*), and the yellow-billed cuckoo (*Coccyzus americanus occidentalis*) all have an extremely low potential to occur within or adjacent to the wind park study area, but may disperse or move through portions of the area. Mexican spotted owls are known to occur in the forested mountains and canyons west and south of the wind park study area and evaluation areas (AGFD 2009b) and may also move through the area; however, suitable nesting habitat is not present within or immediately adjacent to the proposed wind park, and there is no probability of nesting within or adjacent to the wind park study area.

The USFWS provided comments to the Draft EIS stating that the northern Mexican gartersnake (*Thamnophis eques megalops*), listed as a Federal species of concern, and the Chiricahua leopard frog (*Rana chiricahuensis*), listed as a Federal threatened species, are not believed to occur within the wind park study area or be affected by the project.

Federal Threatened or Endangered Wildlife Species (Transmission Tie-Line and Switchyard)

Thirteen wildlife species listed as endangered, threatened, candidate, or non-essential experimental special status species by the Federal ESA occur within Coconino County, Arizona, including four birds, one mammal, one reptile, one amphibian, five fish, and one snail. The majority of these species are not expected to occur within the transmission tie-line evaluation area. Mexican spotted owls are known to occur in the Forest in the vicinity of the transmission tie-line, and while the species move through the area, suitable nesting habitat is not present within or immediately adjacent to the proposed transmission tie-line evaluation area. The USFWS provided comments to the Draft EIS stating that Mexican gartersnake and Chricahua leopard frog are not believed to occur or be affected by the project.

Bald and Golden Eagles

Surveys for bald and golden eagle nests were completed within a 10-mile buffer of all project components (wind park study area, transmission tie-line, switchyard, access road) during Spring 2011 (Tidhar et al. 2011a). Previous nest surveys were completed within a two-mile buffer of Sub-study Area A in 2008 (Young et al. 2009). Avian use surveys, designed to document presence and measure use of birds including eagles, were conducted during 2008–2009 within Sub-Study Area A (Young et al 2009) and are currently underway throughout the wind park study area.

Bald Eagles (Wind Park) – Breeding bald eagles are found near large lakes, reservoirs, or perennial streams throughout central Arizona where they perch in large riparian trees, pines, or on cliffs (Corman and Wise-Gervais 2005). No bald eagle breeding habitat exists within the wind park study area. Raptor nest surveys completed during 2008 did not document any bald eagle nests within two miles of Sub-study Area A (Young et al. 2009), and Spring 2011 surveys within 10 miles of all project components also did not document any bald eagle nests (Tidhar et al. 2011a). During consultation, AGFD indicated the closest breeding territory for the species is located over 15 miles from the wind park study area. There is the potential for over-wintering or migrating eagles to occur over the wind park study area. Bald eagles have been observed at the Raymond Wildlife Area, which is located to the north and west of the wind park

study area (AGFD 2009g). However, during a total of 444 twenty-minute fixed point avian use surveys completed in 2007 and 2008 at Sub-study Area A of the wind park study area, a total of two bald eagles were observed. One individual was sighted during the Winter and one individual was sighted during the Spring (Young et al. 2009). These bald eagles were likely overflying the wind park study area to or from over-wintering range. This low level of use observed during fixed-point surveys does not suggest that the wind park study area is located in an area frequented by bald eagles during any season.

Bald Eagles (Transmission Tie-Line and Switchyard) – Historically, bald eagles have nested along the Mogollon Rim (AGFD 2009e) within 3.5 miles of the proposed transmission tie-line right-of-way. No bald eagle nests were observed during Spring 2011 raptor nest surveys (Tidhar et al. 2011a). Based on unpublished data provided by the AGFD in May 2011, the nearest known bald eagle breeding area nest site recorded over recent years is located greater than ten miles away from the switchyard or transmission tie-line. Wintering or transient bald eagles are known to occur in the vicinity of the transmission tie-line alignment and switchyard site. Mormon Lake and Upper and Lower Lake Mary are important foraging and roosting areas for wintering bald eagles. There is no potential for the species to nest in the vicinity of the transmission tie-line or switchyard, but the bald eagle could be a transient visitor through the transmission tie-line alignment or switchyard area.

Golden Eagles (Wind Park) – During raptor nest surveys completed during Spring 2011, one active golden eagle nest was observed approximately four miles from the wind park study area (Tidhar et al. 2011a). Canyon edges represent the best available nesting structures for golden eagles within the wind park study area. Open grasslands, desert scrublands, and pinyon-juniper woodlands have low potential for nesting golden eagles. Consequently, there is low potential for the species to nest within large portions of the wind park study area. There is the potential for golden eagles to occur over the Grapevine wind park study area year-round. During a total of 444 twenty-minute fixed point avian use surveys completed in 2007 and 2008 at Grapevine Sub-study Area A, a total of eight golden eagles were observed (Young et al. 2009). Four individuals were sighted during the Fall, two were sighted during the Summer, and one was sighted during Winter and Spring. This low level of use was not strongly correlated with any particular portion of the Sub-study area, nor was it the result of a locally active breeding territory, based on raptor nest surveys completed during 2008 (Young et al. 2009). Although formal raptor nest surveys were not conducted at the nearby proposed Sunshine Wind Project, only one golden eagle was observed during 2005–2006 year-round pre-construction avian use surveys (WEST 2006).

Studies have been completed to document the availability of concentrated/colonial prey availability within the wind park study area. Two active and one inactive Gunnison's prairie dog colonies were mapped during baseline wildlife studies conducted in Sub-study Area A (Young et al. 2009) and information from the AGFD received on May 4, 2010 on regional prairie dog colonies was reviewed (Tidhar and Chatfield 2010a). Additional surveys to map and assess the status of prairie dog colonies within the wind park Sub-study areas A, B and C were completed between June and August 2011. Overall, less than 1 percent (766.4 acres) of the wind park study area overlaps active (697.3) and inactive (69.1 acres) prairie dog towns (Figure 3.2-3).

Golden Eagles (Transmission Tie-Line and Switchyard): Few potential nest structures exist for the species within the immediate vicinity of the transmission tie-line or switchyard based on the results of 2010 habitat assessments (Tidhar et al 2010b). This study, in addition to aerial reconnaissance and prey mapping conducted during 2011, documented low prey availability within one mile of the transmission tie-line and switchyard relative to other areas included in the study areas (Tidhar and Chatfield 2010b; Tidhar et al. 2011a). Based on the results of the 2011 raptor nest surveys, no golden eagle nest sites are located in the vicinity of the transmission tie-line or switchyard (Tidhar et al. 2011a). Low numbers of golden eagles may transient or overfly the transmission tie-line and switchyard. Information on year-round avian use collected in Sub-Study Area A of the wind park study area (Young et al. 2009) and at the

Sunshine Wind Park (WEST 2006) indicates relatively low golden eagle use in the region. Those studies did not document high raptor migration activity overall or high golden eagle migration activity.

Other Sensitive Wildlife Species (Wind Park)

The AGFD lists 14 wildlife species as State species of special concern with documented presence within the Canyon Diablo and/or Middle Little Colorado Watersheds. The Site Characterization Report (Appendix D.1, Table 3.3) provides a list of all these species, as well as status, habitat information, and analysis of potential to occur. These State species of special concern include seven birds, one mammal, two reptiles, two amphibians, and two fish. The northern goshawk (*Accipiter gentilis*), Navajo Mexican vole (*Microtis mexicanus navaho*), northern leopard frog (*Lithobates pipiens*), northern Mexican gartersnake, Chiricahua leopard frog, and Little Colorado sucker (*Catostomus* sp.) all have a low potential to occur in the wind park study area. All other State species of special concern have extremely low or no potential to occur within or adjacent to the wind park study area.

Peregrine falcons may occur as a rare Winter visitor or migrant through the wind park study area. No known records exist within five miles of the wind park study area (AGFD and USFWS Correspondence, Appendix D.1). While there is no suitable bald eagle nesting habitat within the wind park study area, there is some potential for wintering or transient bald eagles to occur. There is some potential for goshawks to occur within the patches of ponderosa pine forest located within the wind park study area; however, very limited ponderosa pine forest is present within the evaluation area, and these patches are small in size and are not undisturbed relative to the surrounding landscape. Additionally, no goshawks were observed during baseline avian surveys conducted at either the Grapevine Sub-study Area A (Young et al. 2008) or Sunshine Wind (WEST 2006) studies, and there are no records within five miles of the wind park study area (AGFD and USFWS Correspondence, Appendix D.1). There is low potential for the northern leopard frog to occur in this area primarily because wetland habitat is limited throughout the wind park study area (Tidhar and Chatfield 2010b).

The Little Colorado sucker occurs in creeks, small to medium rivers, and impoundments having pools with abundant cover. According to Heritage Data Management System, the species has been documented in drainages within five miles to the south and southeast of the wind park study area (AGFD and USFWS Correspondence, Site Characterization Report, Appendix D.1). There is some potential for the Little Colorado sucker to occur in several of the larger drainages or springs within the biological resources evaluation area, particularly within Canyon Diablo, Grapevine Canyon, or Jack's Canyon.

The Navajo Mexican vole is found in a wide range of vegetation communities from Great Basin desert scrub and Great Basin woodland to Rocky Mountain montane and subalpine forests. In Coconino County, the species is known to occur on the south rim of the Grand Canyon and approximately 20 miles west of the wind park study area in Walnut Canyon National Monument (AGFD 2009e). Shrub, grassland, and juniper woodland habitats are present within the wind park study area, thus there is potential for the Navajo Mexican vole to occur.

Other Sensitive Wildlife Species (Transmission Tie-Line and Switchyard)

Based on information provided by the Forest, 22 special status wildlife species occur on the Mormon Lake and Peaks Ranger Districts, which encompass the biological resources evaluation area for the transmission tie-line and switchyard. The Wildlife and Botanical Report (Appendix D.2) provides a list of all these species, as well as status, habitat information, and analysis of potential to occur in the vicinity of the transmission tie-line and switchyard. Those species with a low, moderate, or high potential to occur within the transmission tie-line evaluation area are listed in Table 3.2-1. Eleven of these species may occur and/or have suitable habitat within a one-mile buffer of the transmission tie-line and

switchyard evaluation area, while only three may occur within the transmission tie-line right-of-way or switchyard.

The American peregrine falcon is generally found in open country with tall cliffs for roosting or nesting and with open water, woodland, or riparian areas nearby that support abundant avian prey species. The species is unlikely to nest within the transmission tie-line right-of-way due to the lack of suitable cliffs for nesting. Peregrines are regularly observed foraging at wetlands on the Anderson Mesa, and there is potential for peregrines to forage at the lakes within one mile of the transmission tie-line. As a result, the peregrine could be a transient visitor across or through the transmission tie-line alignment or switchyard area while traveling between foraging areas or during migration.

Allen's lappet-browed bat primarily inhabits ponderosa pine, pinyon-juniper, and pine-oak woodlands and riparian areas of sycamore (*Platanus wrightii*), cottonwood (*Populus* spp.), and willow (*Salix* spp.). Maternity colonies and roosts have been found in caves, abandoned mines, rock piles, and beneath the loose bark of large ponderosa pine snags (BCI 2009). This species has been documented within the Canyon Diablo Watershed (AGFD 2009h) in which the transmission tie-line and switchyard are planned. Suitable woodland habitat for foraging is present in the vicinity of the transmission tie-line; however, there is extremely low potential for the species to breed within the area. The species has a high potential to occur during the migration or maternity seasons, either for foraging or in transit, and is wide-ranging and capable of flying long distances of up to 20 miles.

The greater western mastiff bat (*Eumops perotis californicus*) is considered a year-round resident in Arizona; however, within the State it is uncertain whether or not the species hibernates in Winter (AGFD 2009b). The greater western mastiff bat typically occurs in lower and upper Sonoran desertscrub habitats near cliffs. They prefer rugged rocky canyons with abundant crevices, often crowding into tight crevices to roost. They can roost singly or in small groups, but more frequently form colonies of up to 100 individuals (AGFD 2009b). Greater western mastiff bats have very long, narrow wings which make launching difficult. For this reason, they regularly use roosts allowing a vertical drop of at least 10 feet. For the same reason, they are severely limited by available drinking water and are precluded from drinking at ponds less than 100 feet in length (BCI 2009). Roosting habitat in cliffs is generally absent; however, suitable cliff habitat may be available within canyons and along cliffs east of the transmission tie-line. Additionally, the species may forage at larger ponds within the biological resources evaluation area and surrounding region and may transit over the transmission tie-line. The greater western mastiff bat has been documented by the AGFD (2009a) as occurring within the Canyon Diablo Watershed in which the project area occurs, and there is high potential for the species to be present in the region.

Merriam's shrews are associated with sagebrush throughout their range. In Arizona, specimens have been found in or near open ponderosa pine woodlands, spruce-fir stands, and grasslands with patches of aspen and spruce. Of these habitat types, there exists an extremely small area of ponderosa pine forest within the evaluation area, and no records for the species exist within the study area; therefore, the species has been ranked as having a low probability for occurrence.

Pale Townsend's big-eared bat is widespread in Arizona. They typically occur in arid desert scrub habitats up to woodlands and coniferous forests. There is no potential for the species to occur during breeding or over-wintering seasons due to the lack of suitable roost sites or hibernacula. The species is widespread and likely forages at wetlands, ponds, and lakes and, therefore, the potential for occurrence in the vicinity of the transmission tie-line is considered low for foraging and/or migrating bats.

Forest Service Management Indicator Species (Transmission Tie-line and Switchyard)

Forest Service MIS were evaluated for the transmission tie-line, alternative transmission tie-line and switchyard only. The Coconino National Forest Plan identifies 17 MIS defined as

> *...plants or animals whose population change reflects a population change in other species within a group. MIS respond to habitat changes early or at low levels of stress and, therefore, are sensors of the effect of management activities that occur in various habitat"* (Forest Service 2002).

As such, MIS were selected to serve as a benchmark for potential effects of management actions on other species within the particular habitat type for which they were chosen. The Wildlife and Botanical Report (Appendix D.2, Table 3.4) provides a list of these 17 species, as well as habitat information and analysis of potential to occur within the transmission tie-line, alternative transmission tie-line route, and switchyard ("tie-line components") portion of the project. Nine may occur along transmission tie-line and switchyard components and are presented in Table 3.2-2.

TABLE 3.2-2
COCONINO NATIONAL FOREST MANAGEMENT INDICATOR SPECIES WITH THE POTENTIAL TO OCCUR IN THE TRANSMISSION TIE-LINE AND SWITCHYARD PORTION OF THE PROJECT

Species	Potential to Occur within Transmission Tie-line Alignment or Switchyard	Potential to Occur within One Mile of Transmission Tie-line Alignment or Switchyard
BIRDS		
Cinnamon teal *Anas cyanoptera*	None	High
Hairy woodpecker *Picoides villosus*	Low	High
Juniper titmouse *Baeolophus griseus*	High	High
Pygmy nuthatch *Sitta pygmaea*	Low	High
Wild turkey *Meleagris gallopavo merriamii*	Low	Moderate
MAMMALS		
Abert squirrel *Scirurus aberti*	Low	High
Elk *Cervus elaphus*	Moderate	High
Mule deer *Odocoileus hemonius*	High	High
Pronghorn antelope *Antilocapra americana americana*	High	High

Wildlife Common to the Wind Park, Transmission Tie-line, and Switchyard

Several biological resources, including raptors, migratory and breeding birds, bats, and big game, are similar throughout the wind park, transmission tie-line, and switchyard evaluation areas. These species common to the wind park, transmission tie-line, and switchyard are described below.

Raptors

Raptor information was collected from the Arizona Breeding Bird Atlas (Corman and Wise-Gervais 2005) and Sibley (2001). Seventeen diurnal raptor species have the potential to occur as residents and/or migrants in the wind park study area at some point during the year. In addition, one species of vulture and five species of owls occur in the region. Of the 17 diurnal raptors with the potential to occur in the project area, 6 species have the potential to nest or reside year-round: sharp-shinned hawk (*Accipiter striatus*), Cooper's hawk (*Accipiter cooperii*), red-tailed hawk (*Buteo jamaicensis*), golden eagle, American kestrel (*Falco sparverius*), and prairie falcon (*Falco mexicanus*). Three species may occur as Winter residents and/or migrants: northern harrier (*Circus cyaneus*), ferruginous hawk, and rough-legged hawk (*Buteo lagopus*). Eight species are not likely to reside in the area due to specific habitat requirements, but may pass through as migrants and/or occasional visitors from the surrounding region: zone-tailed hawk (*Buteo albonontatus*), Swainson's hawk (*Buteo swainsonii*), northern goshawk, common black hawk (*Buteogallus anthracinus*), bald eagle, osprey (*Pandion haliaetus*), peregrine falcon, and merlin (*Falco columbarius*). Additionally, turkey vultures (*Cathartes aura*) are likely Summer residents. Of the diurnal raptors and vultures potentially occurring, six species are considered wildlife of special concern by the AGFD (2009a): northern goshawk, common black hawk, ferruginous hawk, bald eagle, osprey, and peregrine falcon. Bald eagle, ferruginous hawk, and sharp-shinned hawk have been documented within the Raymond Wildlife Area immediately to the north and west of the wind park study area (AGFD 2009e), though State natural heritage records from within five miles of the transmission tie-line evaluation area include only the bald eagle (Appendix D.1).

Five owl species have the potential to nest or reside year-round within the wind park study area: barn owl (*Tyto alba*), long-eared owl (*Asio otus*), burrowing owl (*Athene cunicularia*), great horned owl (*Bubo virginianus*), and western screech-owl (*Megascops kennicottii*). Of the owl species potentially occurring within the wind park study area, burrowing owls are considered a species of concern by the USFWS and a Forest Service sensitive species and have been observed at the Raymond Wildlife Area (AGFD 2009e). Limited portions of the transmission tie-line (16 acres) have some potential to support nesting northern saw-whet owl (*Aegolius acadicus*), northern pygmy owl (*Glaucidium gnoma*), and flammulated owl (*Otus flammeolus*) due to the presence of potential breeding and foraging habitat in the form of ponderosa pine forest at higher elevations.

During baseline wildlife studies at Sub-study Area A (Young et al. 2008), 10 raptor species were observed either as residents or during migration: Cooper's hawk, sharp-shined hawk, red-tailed hawk, northern harrier, bald eagle, golden eagle, American kestrel, merlin, prairie falcon, and burrowing owl. Raptor species richness may be less in portions of Sub-study areas B and C, which contain greater proportions of grassland and desert scrub. This difference is suggested by avian survey results conducted at the nearby proposed Sunshine Wind Park where fewer species (six) were sighted (WEST 2006). Similarly, abundance of raptors is likely to be less in open grassland or desert scrub areas where nesting and roost structures are less abundant and prey density is lower (Tidhar et al. 2011a). Avian use surveys conducted at nearby proposed Sunshine Wind Project indicate lower abundance of raptors, particularly for golden eagle, relative to surveys conducted at the Sub-study Area A (WEST 2006; Young et al. 2009).

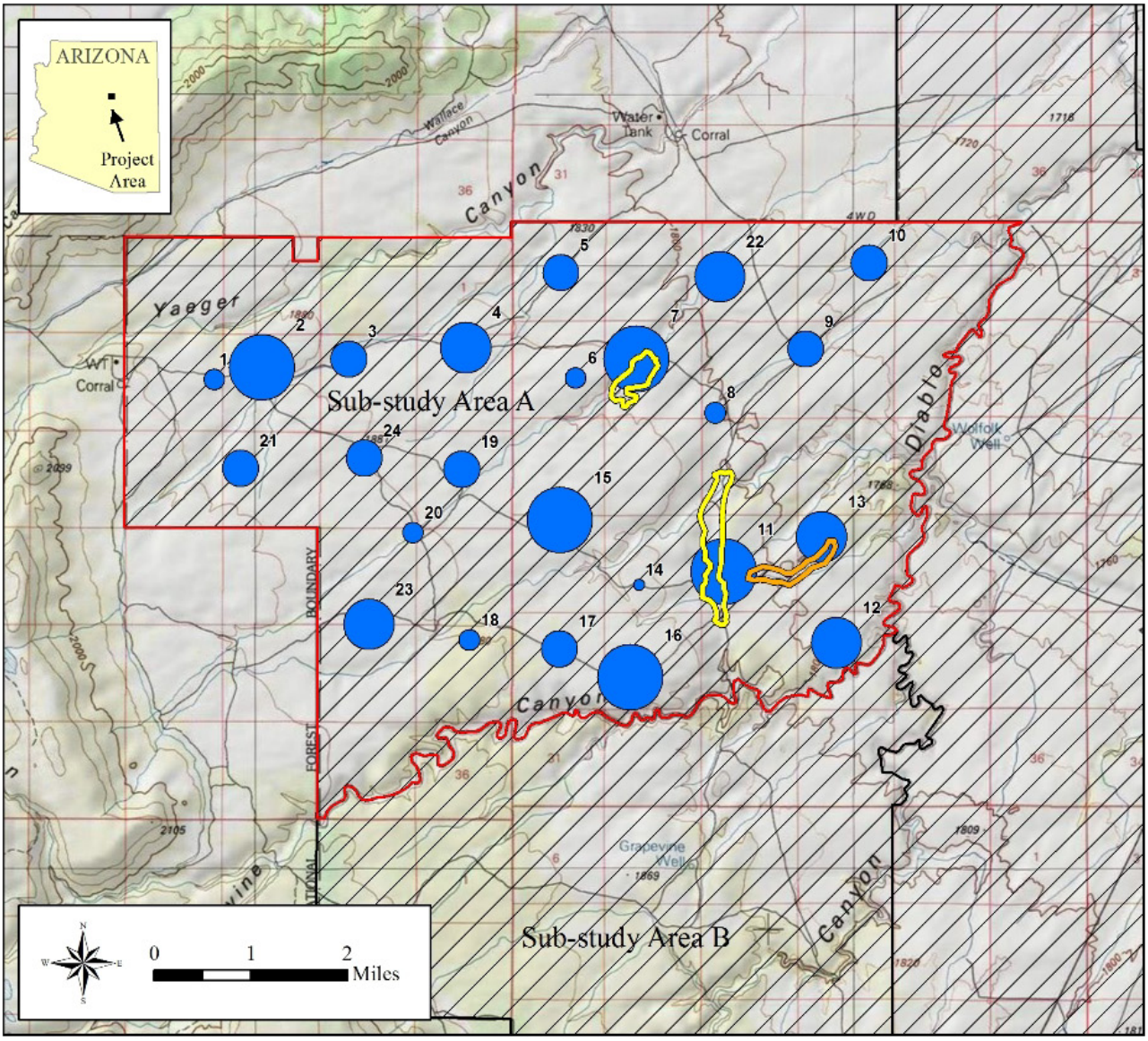
Potential Raptor Nesting Habitat – Potential nesting habitat for raptors is located primarily along the major drainages within the wind park study area: Canyon Diablo, Grapevine Canyon, Yaeger Canyon, and Jack's Canyon. Stands of oak and cottonwood in the canyon bottoms, as well as canyon walls and rock outcroppings, may potentially provide nest sites for raptors such as golden eagles, red-tailed hawks, American kestrels, prairie falcons, barn owls, and great horned owls. Additionally, small areas of pinyon-juniper woodland, juniper savannah, and ponderosa pine forest, particularly in western portions of Sub-study areas A and B, may also provide nest structures for raptors. Open, grassland habitats for ground-nesting species, such as burrowing owl, are present throughout the wind park study area, especially within

Gunnison's prairie dog (*Cynomys gunnisoni*) colonies which have been documented in the wind park study area (Young et al. 2009; Tidhar and Chatfield 2010a). More extensive stands of ponderosa pine and pinyon-juniper forests are present within the western portion of the transmission tie-line evaluation area, and there is some potential for forest-dwelling raptors, such as northern goshawk, Cooper's hawk, sharp-shinned hawk, western screech-owl, northern saw-whet owl, northern pygmy owl, and flammulated owl, to occur in these areas.

During raptor nest surveys completed within a two-mile buffer of Sub-study Area A of the project in 2008, one active/occupied red-tailed hawk nest was observed and two unoccupied golden eagle nests were observed within Grapevine Canyon (Young et al. 2009). During raptor nest surveys completed within a 10-mile buffer of all project components during 2011, one active golden eagle nest was observed and several unoccupied golden eagle, red-tailed hawk, unidentified buteo, and unidentified stick nests were observed (Tidhar et al. 2011a). A single occupied red-tailed hawk nesting territory and nest site was documented adjacent to Corner Lake approximately one mile from the proposed transmission tie-line and 1.3 miles from the transmission tie-line alternative (Tidhar and Chatfield 2010b). No raptor nests were located along or within approximately 0.25 mile of the transmission tie-line route during a site visit completed during Summer 2009 (Tidhar and Chatfield 2010b). No raptor nests were documented within 0.5 mile of the transmission tie-line during raptor nest surveys completed during Spring 2011 (Tidhar et al. 2011a). Given the proximity of an existing road and general lack of optimal nest structures the likelihood of nesting raptors to occur in, or proximate to, the transmission tie-line is low.

Areas of Potentially High Prey Density – Two active and one inactive Gunnison's prairie dog colonies were mapped during 2007–2008 baseline wildlife studies conducted in Sub-study Area A (Figure 3.2-2) (Young et al. 2009), and information from the AGFD on regional prairie dog colonies was obtained (Tidhar and Chatfield 2010a). Additional surveys to map and assess the status of prairie dog colonies within the wind park study area were completed during Summer 2011 (Figure 3.2-3) (Tidhar et al. 2011a). These surveys identified a total of 23 prairie dog towns totaling 764 acres within the wind park study area (less than one percent). The majority of prairie dog towns were located within Sub-Study Area A, much of which overlapped areas during 2007–2008 surveys. Many of the prairie dog towns were small and ranged in size from 0.07 acre to 251.3 acres. Fifteen towns were active while eight towns were inactive and appeared old and abandoned. Prairie dog colonies are important foraging grounds for several raptor species likely to occur, including golden eagle, red-tailed hawk, northern harrier, and ferruginous hawk. Prairie dog colonies also provide breeding and foraging habitat for burrowing owls. Colonies may serve to concentrate raptors in portions of the wind park study area throughout the year. During 2007–2008 avian use surveys, higher raptor use was observed at survey points located near active prairie dog towns relative to other portions of Sub-study Area A. Correspondence received May 4, 2010 from the AGFD included mapped prairie dog colonies present in Sub-study areas A and C, but otherwise few colonies are located within approximately 3 miles of the wind park study area.

Additionally, waterfowl and shorebirds using the few open water features present in the wind park evaluation area may also attract raptor species. These features include stock ponds and small ephemeral and perennial pools within canyon bottom streams and waterbodies. Other types of prey likely to be present are rodent and shrew species associated with semi-arid to arid grassland, shrub, and juniper woodland areas. Lagomorphs that may occur in the area include desert cottontail and black-tailed jackrabbit (*Lepus californicus*); however, these species are not expected to occur at greater density within the wind park study area relative to the surrounding landscape.



Legend

Proposed Wind Park Study Area

Observation Point

Raptor Use by Point

0.00 - 0.25

0.25 - 0.50

0.50 - 0.75

0.75 - 1.00

1.00 - 2.00

Grapevine Sub-study Area A

Prairie Dog Towns

Active

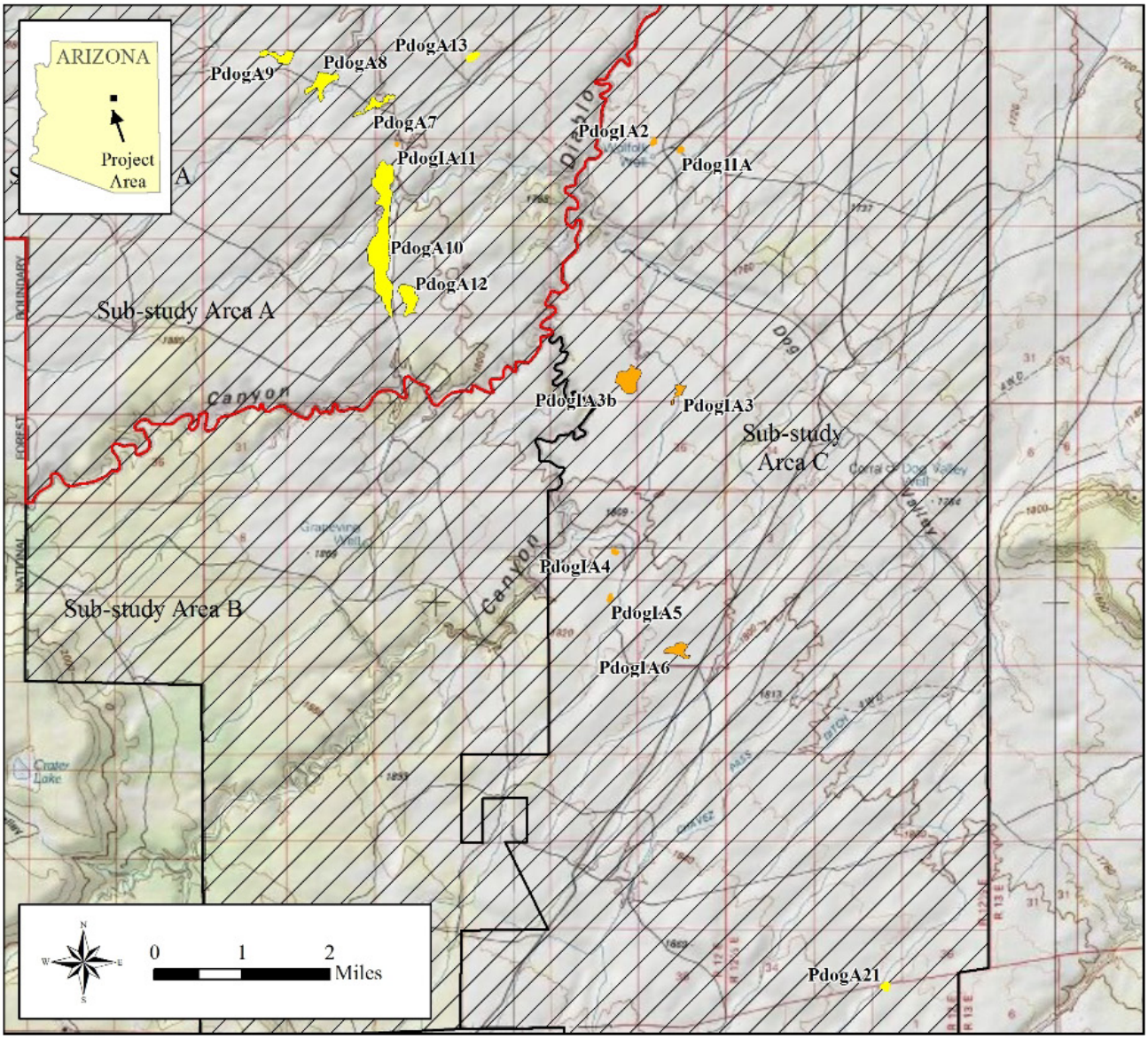
Inactive

Raptor Use in Relation to Prairie Dog Colonies - Sub-study Area A

Grapevine Canyon Wind Project

FIGURE 3.2-2

Number of observations per 20-minute observation.
Data plotted separately for eagle (bald, golden and unidentified) observations only, and all raptor species observations combined (golden eagle, bald eagle, Cooper's hawk, sharp-shinned hawk, red-tailed hawk, northern harrier, merlin, American kestrel, prairie falcon, western burrowing owl, unidentified buteo, unidentified eagle, unidentified falcon and unidentified raptor).
Source: Young et al 2009



Legend

Proposed Wind Park Study Area

Grapevine Canyon Wind Park Sub-study Area A

2011 Prairie Dog Towns

Active

Inactive

Prairie Dog Towns - Status

Grapevine Canyon Wind Project

Tidhar et al. 2011a

FIGURE 3.2-3

Other Migratory and Breeding Birds

Most species of birds are provided protection by the Migratory Bird Treaty Act (MBTA), which states that it is unlawful to take, kill, or possess any bird listed under its protection. Legal protection for migratory birds is further explained under EO 13186 (2001). The project biological resources evaluation area contains stopover habitat for songbirds, waterfowl, and shorebirds in the forms of grassland, shrubland, pinyon-juniper woodland, and a few wetland/riparian areas, and it is likely that migrating birds utilize these areas during migration.

Important Bird Areas – Songbirds (Order Passeriformes) are by far the most abundant bird group in most terrestrial ecosystems and are the most often reported fatalities at wind-energy facilities (NRC 2007; NWCC 2010). The Audubon Society lists Important Bird Areas (IBAs) that are sites providing essential habitat for one or more species of bird (National Audubon Society 2009). These include sites for breeding, wintering, and/or migrating birds and can range from a few, to thousands of, acres in size. The proposed wind park study area lies immediately to the east of a portion of the Anderson Mesa IBA located within the Forest. Anderson Mesa begins about nine miles southeast of Flagstaff and extends as a gently sloping tableland for approximately 25 miles to the southeast. The wind park study area lies along a portion of the northeastern edge of the Anderson Mesa while the proposed transmission tie-line extends east-west across a portion of the mesa.

Along the length of the Anderson Mesa is a complex of permanent, semi-permanent, and ephemeral lakes and wetlands, plus grasslands, pinyon-juniper woodland, and conifer forests. The largest of the lakes, Mormon Lake, lies approximately 10.0 and 3.5 miles to the west of the wind park evaluation area and western terminus of the proposed transmission tie-line, respectively. Some smaller features are located within 2 miles of the transmission tie-line, but the proposed and alternate transmission tie-line routes do not overlay any of these. The wetland complex within the Anderson Mesa IBA has been documented as one of two major waterfowl use areas in Arizona during migration, particularly by dabbling ducks during Spring migration (National Audubon Society 2009). A variety of land birds also use the IBA for breeding and as a migration stopover site. The extensive pinyon pine and juniper woodlands in the area support populations of pinyon jay (*Gymnorhinus cyanocephalus*), a species of global conservation concern because of the limited distribution of pinyon pine on which the species depends (National Audubon Society 2009).

USFWS Birds of Conservation Concern – The wind park study area lies near the southwestern boundary of the Southern Rockies/Colorado Plateau Bird Conservation Region. Twenty-seven species are listed by the USFWS as Birds of Conservation Concern within this region (USFWS 2008; Table 3.2-3). These species, like other species of migratory birds, are protected under the MBTA, but do not receive additional special protections unless they are also listed by the USFWS under the ESA, Eagle Protection Act, or by the AGFD, but have been identified as vulnerable to population declines in the area by the USFWS (2008). Of these, four species have been documented by Arizona's Natural Heritage Program as occurring within the Canyon Diablo and/or Middle Little Colorado Watersheds: bald eagle, ferruginous hawk, peregrine falcon, and burrowing owl (AGFD 2009).

During WEST's 2007/2008 baseline avian surveys at Sub-study Area A, seven USFWS species of conservation concern were observed: bald eagle, ferruginous hawk, prairie falcon, burrowing owl, gray vireo (*Vireo vicinior*), pinyon jay, and Cassin's finch (*Carpodacus cassinii*) (Young et al. 2009). USFWS correspondence (see Appendix A of Tidhar and Chatfield 2010a) identifies the gray vireo, loggerhead shrike (*Lanius ludovicianus*), and olive-sided flycatchers (*Contopus cooperi*) as species potentially affected by project development. A total of three detections of gray vireos, 32 of loggerhead shrikes, and zero of olive-sided flycatchers were recorded during Sub-study Area A surveys (Young et al. 2009). During avian surveys conducted at the proposed nearby Sunshine Wind Park, 13 detections of loggerhead

shrikes and none of gray vireos or olive-sided flycatchers were recorded (WEST 2006). Potential occurrence of gray vireo and olive-sided flycatcher is greatest in open woodlands and associated areas primarily located west of the Grapevine wind park evaluation area atop Anderson Mesa. These data suggest that there is lower probability that these species would occur within the wind park study area compared with Anderson Mesa. Data from the nearby proposed Sunshine Wind Project studies indicate low breeding or probability of occurrence for these species in open grasslands associated with large portions of the wind park study area. Loggerhead shrike habitat is available within the wind park study area and within the wider region; the species is not listed as a USFWS bird of conservation concern in Southern Rockies/Colorado Plateau Bird Conservation Region (Table 3.2-3).

TABLE 3.2-3
BIRD SPECIES OF CONSERVATION CONCERN WITHIN THE SOUTHERN ROCKIES/COLORADO PLATEAU BIRD CONSERVATION REGION

Species	Scientific Name
Gunnison sage-grouse	*Centrocercus minimus*
American bittern	*Botaurus lentiginosus*
bald eagle (b)	*Haliaeetus leucocephalus*
ferruginous hawk	*Buteo regalis*
peregrine falcon (b)	*Falco peregrines*
prairie falcon	*Falco mexicanus*
snowy plover (c)	*Charadrius alexandrines*
mountain plover	*Charadrius montanus*
long-billed curlew	*Numenius americanus*
yellow-billed cuckoo (a)	*Coccyzus americanus*
flammulated owl	*Otus flammeolus*
burrowing owl	*Athene cunicularia*
Lewis's woodpecker	*Melanerpes lewis*
willow flycatcher (c)	*Empidonax traillii*
gray vireo	*Vireo vicinior*
pinyon jay	*Gymnorhinus cyanocephalus*
juniper titmouse	*Baeolophus ridgwayi*
Veery	*Catharus fuscescens*
Bendire's thrasher	*Toxostoma bendirei*
Grace's warbler	*Dendroica graciae*
brewer's sparrow	*Spizella breweri*
grasshopper sparrow	*Ammodramus savannarum*
chestnut-collared longspur	*Calcarius ornatus*
black rosy-finch	*Leucosticte atrata*
brown-capped rosy-finch	*Leucosticte australis*
Cassin's finch	*Carpodacus cassinii*

(a) ESA candidate; (b) ESA delisted; (c) non-listed subspecies or population of threatened or endangered species
Source : USFWS 2008

Arizona Partners in Flight Priority Species – Partners in Flight is an international program dedicated to conserving bird populations in North and South America. The program was initiated in 1990 as a cooperative effort among Federal, State, and local government agencies, professional organizations, conservation groups, academia, industry, and private individuals. The Arizona Working Group of Partners in Flight (APIF) has developed a Bird Conservation Plan (Latta et al. 1999) as part of the international Partners in Flight effort. The purpose of the plan is to identify avian species and habitats most in need of conservation and to establish objectives and conservation efforts for bird populations and habitats within Arizona. The plan addresses 280 breeding bird species within Arizona, including 43 priority species within 13 major habitat types. Of the major habitat types identified within the plan, three

are present within the wind park study areas and/or transmission tie-line evaluation areas: ponderosa pine forest, pinyon-juniper forest, and high elevation grassland. Priority bird species identified for each of these habitat types, and their potential to occur in the wind park study area is addressed in Table 3.2-4. Additional information regarding these species and their potential for occurrence is found in Appendix D.1. Three species associated with pinyon-juniper habitats (pinyon jay, gray vireo [*Vireo vicinior*], and juniper titmouse [*Baeolophus ridgwayi*]) have high potential for occurrence. One-hundred and ninety seven pinyon jays were observed during avian use studies at Sub-study Area A, of which 65 percent (127) occurred during the Fall season and were likely migrants. Three gray vireos and eight juniper titmice were observed during year-round surveys. None of these species was observed at the nearby proposed Sunshine Wind Project (WEST 2006), and these results are indicative of the absence of suitable habitat. Based on habitat availability, the probability for these species to occur in Sub-study Area C is low compared with Sub-study Areas A and B. Four western burrowing owl detections were made during avian surveys completed at Sub-study Area A within or near Gunnison's prairie dog towns (Young et al. 2009). Prairie dog towns provide foraging and nesting habitat for the species. Summer 2011 surveys identified a total of 23 prairie dog towns totaling 764 acres within the wind park study area (less than one percent of the wind park study area) (Tidhar et al. 2011a). The majority of prairie dog towns were located within Sub-Study Area A. Many of the prairie dog towns were small and ranged in size from 0.07 acre to 251.3 acres (Figure 3.2-4).

TABLE 3.2-4
ARIZONA PARTNERS IN FLIGHT PRIORITY AVIAN SPECIES WITH POTENTIAL TO OCCUR ALONG THE TRANSMISSION TIE-LINE AND WITHIN THE WIND PARK STUDY AREA

Habitat Type	Species	Potential for Occurrence – Wind Park Study Area	Potential for Occurrence – Transmission Tie-Line
Ponderosa pine	northern goshawk *Accipiter gentilis*	Extremely Low	Extremely Low
	olive-sided flycatcher *Contopus cooperi*	Extremely Low	Low
	cordilleran flycatcher *Empidonax occidentalis*	Extremely Low	Extremely Low
	purple martin *Progne subis*	Extremely Low	Low
Pinyon-juniper	gray flycatcher *Empidonax wrightii*	Extremely Low	Extremely Low
	pinyon jay *Gymnorhinus cyanocephalus*	High	High
	gray vireo *Vireo vicinior*	High	High
	black-throated gray warbler *Dendroica nigrescens*	Moderate	Moderate
	juniper titmouse *Baeolophus ridgwayi*	High	High
High elevation grassland	ferruginous hawk *Buteo regalis*	Extremely Low	Extremely Low
	Swainson's hawk *Buteo swainsonii*	Extremely Low	Extremely Low
	burrowing owl *Athene cunicularia*	Low	Extremely Low
	grasshopper sparrow *Ammodramus savannarum*	None	None

Source: Latta et al. 1999

Breeding Birds: The USGS Breeding Bird Survey (BBS) is a large-scale survey of North American breeding birds (Sauer et al. 2008). Each June over 3,500 designated routes in the continental U.S. and southern Canada are surveyed by experienced birders. Each BBS route is 24.5 miles long and consists of 50, three-minute point counts along the length of the route. Information gathered from these surveys allows some indication of species that may utilize the region either transiently or for breeding habitat during the Summer. The BBS routes closest to project components are the Happy Jack and Forest Lakes routes; however, these routes are located in the higher-elevation, forested region to the west and south of the wind park evaluation area and generally do not contain habitat types representative of the wind park study area. Alternatively, the Castle Buttes route located approximately 40 miles to the northeast is characterized by Great Basin shrub and grassland habitats more likely to support bird species found within the wind park evaluation area.

The Happy Jack route has been surveyed for 17 years between 1985 and 2007. A total of 65 species have been observed along this route, including six raptor species and one vulture species (bald eagle, sharp-shinned hawk, northern goshawk, red-tailed hawk, American kestrel, great-horned owl, and turkey vulture) (Sauer et al. 2008). The most common species observed along this route were pygmy nuthatch (*Sitta pygmaea*), American robin (*Turdus migratorius*), violet-green swallow (*Tachycineta thalassina*), dark-eyed junco (*Junco hyemalis*), Grace's warbler (*Dendroica graciae*), and plumbeous vireo (*Vireo plumbeus*), each with an average of less than10 individuals sighted per year. No Federally listed species have been observed along the route. Two state wildlife species of special concern and Forest Service sensitive species (bald eagle and northern goshawk) and two Federal birds of conservation concern (Grace's warbler, Cassin's finch) have been observed along the route (USFWS 2008; AGFD 2009b; Forest Service 2009). Raptors observed on the Happy Jack and Forest Lakes routes include bald eagle, northern goshawk, sharp-shinned hawk, peregrine falcon, and great horned owl. Of these, bald eagle, northern goshawk, and peregrine falcon are considered state species of special concern by the AGFD (2009a).

The Castle Buttes route have been monitored for seven years between 1992 and 2007. A total of 38 species have been observed along this route, including four raptor species and one vulture species (red-tailed hawk, golden eagle, American kestrel, prairie falcon, and turkey vulture) (Sauer et al. 2008). The most common species observed along this route were horned lark (*Eremophila alpestris*), common raven (*Corvus corax*), western meadowlark (*Sturnella neglecta*), mourning dove (*Zenaida macroura*), Cassin's kingbird, and lark sparrow (*Chondestes grammacus*) with an average of greater than 10 individuals sighted per year. This is generally similar to the most common species observed during the avian use surveys conducted by WEST during the Summer of 2007 at Sub-study Area A of the wind park study area which included detections of lark sparrow, horned lark, and northern mockingbird (Young et al. 2009). No Federal threatened or endangered species or state species of special concern have been observed along the Castle Buttes route, but two Federal species of conservation concern have been observed: prairie falcon and pinyon jay (USFWS 2008). Four prairie falcons and 197 pinyon jay were observed during the avian use surveys conducted by WEST during the Summer of 2007 at Sub-study Area A of the wind park evaluation area (Young et al. 2009).

Avian Migration

Songbirds – The wind park study area lies within the Intermountain West region of the extensive American Pacific Flyway, one of five primary migratory routes for waterbirds, shorebirds, songbirds, and raptors. Many species of songbirds migrate at night and may collide with tall man-made structures during migration periods, particularly during weather conditions that force them to fly at lower altitudes and within the turbine rotor swept area (NWCC 2010; Manville 2009). It is generally assumed that nocturnal migrating passerines move in broad fronts rather than along specific topographical features (Gauthreaux

et al. 2003; NRC 2007). Overall passerine use of Sub-study Area A (as determined by the number of observations per 20-minute avian use survey) was highest during Winter (Young et al. 2009).

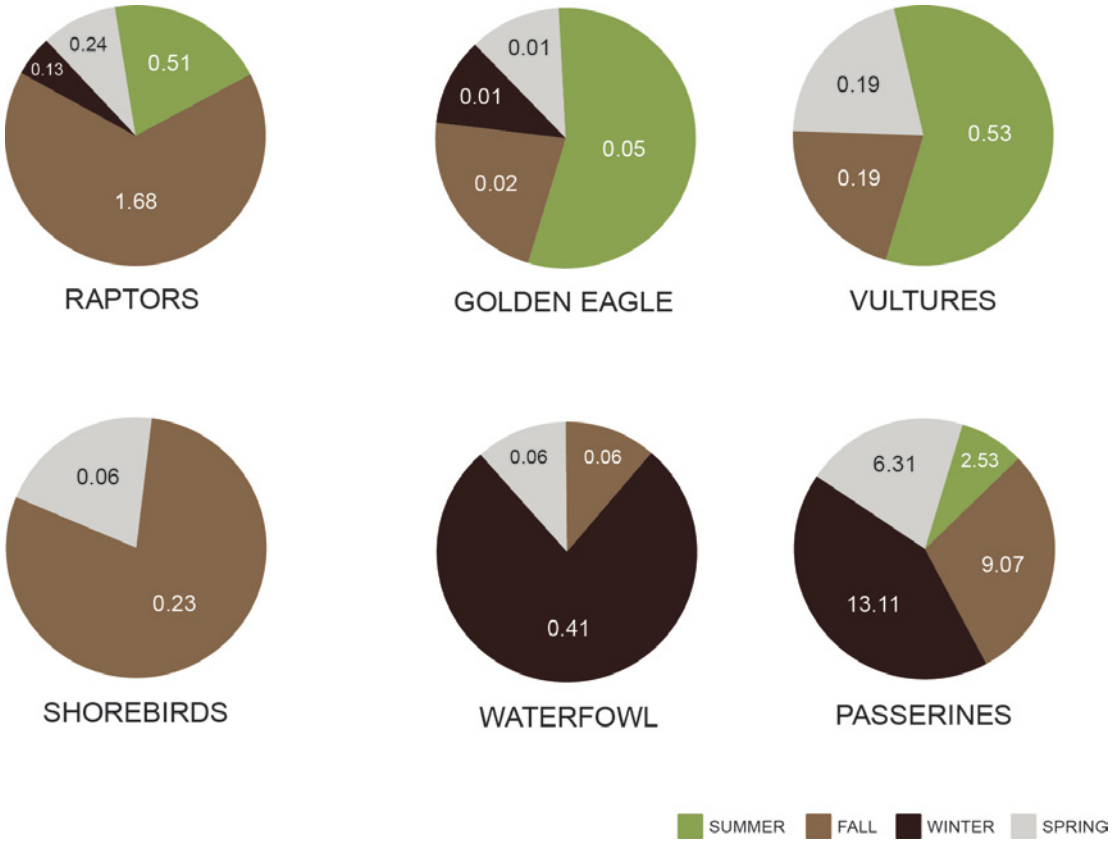
Waterfowl – During avian baseline surveys completed at Sub-study Area A in 2007 and 2008, use by resident and migrating waterfowl and shorebirds was found to be low, comprising less than 3 percent of overall bird use (Young et al. 2009). Observations for these bird groups was even lower during surveys conducted at the proposed nearby Sunshine Wind Project (WEST 2006), suggesting that waterfowl and shorebird use declines away from the Anderson Mesa. While the wind project study area itself has very little wetland habitat, the wetland complex along the Anderson Mesa west of the wind park study area and adjacent to the transmission tie-line has been documented as one of two major waterfowl use areas in Arizona during migration, particularly by dabbling ducks during Spring migration (National Audubon Society 2009; see section *Important Bird Areas*).

Raptors – Several factors influence the migratory pathways of raptors, the most significant of which is geography. Two geographical features primarily used by raptors during migration are ridgelines and the shorelines of large bodies of water. Updrafts formed as the wind hits the ridges and thermals created over land (and not water) make for energy-efficient travel over long distances. It is for this reason that raptors tend to follow corridors or pathways, for example along prominent ridges with defined edges or shorelines, during migration.

While it is certain that raptors migrate through the wind project study area, the majority of the site is characterized by a flat upland plain that would generally not be expected to concentrate or funnel raptors during migration. This plain may create thermal conditions which would be expected to provide flight conditions conducive to efficient migration of raptors at relatively high altitudes. The presence of several larger canyons in the area (particularly the Canyon Diablo and Grapevine Canyon through the central portions of the wind park study area, Yaeger and Anderson Canyons in the northwest corner of the wind park study area, and Jack's Canyon in the southeast [Figure 3.2-2]) may serve as important stopover areas for some raptor species during migration. The potential exists for migrating birds that utilize updrafts to concentrate along these canyon rims, such as raptors that utilize updrafts and thermals created by topography.

Additionally, the presence of Gunnison's prairie dog colonies (Tidhar et al. 2011a) and waterfowl/shorebirds concentrated at water sources could also attract resident and migrating raptors. The western-most portions of the transmission tie-line evaluation area, to the west of Sub-study Area A and B of the wind park study area, have greater topographic relief, as well as a greater number of seasonal ponds and lakes and therefore, may be more likely to attract migrating raptors. Avian use studies conducted at Sub-study Area A (Young et al. 2009) indicate Fall raptor use was relatively high (1.68 raptors per plot per 20-minute survey) compared with other seasons (Winter: 0.13; Spring: 0.24; Summer: 0.51 raptors per plot per 20-minute survey; Figure 3.2-4). Fall 2007 raptor use resulted primarily from increased observations of red-tailed hawks, but also included greater species diversity relative to other seasons (Young et al. 2009). Raptor observations also peaked during the Fall migration period at the nearby proposed Sunshine (WEST 2006); however, with less overall activity than observed at Sub-study Area A. These observations suggest the area is used by some migrating raptors.

FIGURE 3.2-4



Mean bird use (number per plot per 20-minute survey) by season for major bird types and golden eagle at the Grapevine Canyon Wind Park Sub-study Area A (Young et al. 2009).

Bat Species

Due to the current lack of understanding of bat populations in North America, the species and relative abundance of bats occurring within the biological resources evaluation area are difficult to determine. Based on range maps and species accounts from AGFD and Bat Conservation International (2009) 28 species of bat are known to occur in Arizona, with 20 species having an approximate range that includes the evaluation area or surrounding region. Of these 20 species, 13 have the potential to roost or forage within the transmission tie-line or wind park study area: Allen's lappet-browed bat, greater western mastiff bat, pallid bat (*Antrozous pallidus*), pale Townsend's big-eared bat, big brown bat (*Eptesicus fuscus*), spotted bat, California myotis (*Myotis californicus*), western small-footed myotis (*Myotis ciliolabrum*), Arizona myotis (*Myotis occultus*), fringed myotis (*Myotis thysanodes*), big free-tailed bat (*Nyctinomops macrotis*), canyon bat (*Parastrellus hesperus*), and Mexican free-tailed bat (*Tadarida brasiliensis*). An additional three species are likely seasonal migrants through the wind park study area: silver-haired bat (*Lasionycteris noctivagans*), western red bat (*Lasiurus blossevillii*), and hoary bat. Bat mist net and emergence count surveys were completed by WEST during the Fall 2011 migration season within the wind park study area (Tidhar et al. 2011b). Six species were identified during surveys: Arizona myotis, Yuma myotis, western small-footed myotis, pale Townsend's big eared bat, big brown bat, and pallid bat.

The most likely roosting habitat for bats within the biological resources evaluation area is within the Diablo and Grapevine canyons. Caves, crevices, and rock outcrops along the canyon walls likely provide habitat for roosting and hibernating bats. Abandoned structures located within the wind park study area also provide roosting habitat for bats. Juniper savannah/woodlands may also provide roosting habitat for tree-roosting species. Bats forage at the creeks, springs, ponds, and stock tanks throughout the evaluation area, and these areas are likely to concentrate both resident and migrant species. Fall 2011 bat surveys targeted water features, canyon bottoms, and abandoned structures. Among mist net sites, capture rates were highest at stock tanks and lowest within the canyon bottom. Among abandoned structures surveyed, only one abandoned house contained roosting bats—an abandoned house located outside of proposed development areas.

Big Game

The wind park, transmission tie-line, and switchyard evaluation areas provide habitat for several species of big game including elk, mule deer, and pronghorn antelope. All three species were observed during 2007–2008 surveys at Sub-study Area A.

Elk – Elk populations within Arizona are considered to be demonstrably widespread, abundant, and secure state-wide (AGFD 2009e) with the elk herds occurring in the Forest and surrounding State and private lands considered the core of Arizona's elk population (AGFD 2007a). The elk in this region typically summer in mountain meadows and montane coniferous forests and winter in lower-elevation pinyon-juniper woodlands and grasslands (Forest Service 2002; AGFD 2007a). The elk herd occurring in the 5BN Game Management Unit (AGFD 2008), in which the transmission tie-line and switchyard are located, is considered stable (AGFD 2007a). Ponderosa pine, pinyon-juniper woodland, and grassland habitats used by elk are present within the wind park study, transmission tie-line, and switchyard areas. The species is likely to occur during the Winter and possibly throughout the year.

Mule Deer – Mule deer typically summer at high elevation aspen and ponderosa pine forests and winter in lower elevation pinyon-juniper woodlands (Forest Service 2002). While mule deer populations within Arizona are considered to be demonstrably widespread, abundant, and secure state-wide (AGFD 2009e), from 1985 to 2001 a declining trend in mule deer populations has been observed on the Forest (Forest Service 2002). This may be due to a number of factors including disease, poaching, climatic conditions (drought), and habitat changes. Populations in the past few years appear to have stabilized, possibly in response to increased precipitation in recent years (AGFD 2008). Habitats used by mule deer (e.g., pinyon-juniper woodlands, ponderosa pine forests) are present in the vicinity of the transmission tie-line and switchyard, and the species is likely to occur in these areas.

Pronghorn – Most pronghorn occur between 3,000 and 7,000 feet elevation and inhabit a variety of habitat types from desert grassland to forest and mountain meadows; however, they generally prefer flat, open grassland areas (AGFD 2007b). The transmission tie-line, switchyard, and the wind park study area fall within the range of the Anderson Mesa herd of pronghorn antelope. This population declined throughout recent decades as a result of habitat degradation and drought (AGFD 2007b; Forest Service 2002). The pronghorn in this area are functionally split into two groups; one group spends the Winter at lower elevation grasslands and spends the rest of the year on Anderson Mesa, and the second group lives year-round in the lower elevation habitat. The majority of the herd winters in grasslands and shrublands. Migration movement through the wind park study area is moderate (Appendix D.1). This herd has been the focus of research and habitat improvement treatments managed by AGFD (Tidhar and Chatfield 2010a) which have occurred within and outside the biological evaluation area. The overall trend for grasslands within the Forest is stable to declining due to tree encroachment, fire suppression, long-term climatic trends, short-term drought, and wildlife grazing (Forest Service 2002).

3.2.2 Environmental Consequences

This section evaluates the project's impacts on biological resources. Primary concerns are impacts to Federally- and State-listed species, Forest Service MIS and sensitive species, birds, bats, and big game. Definitions of impacts are as follows:

- Short-term impacts are those that last through the construction phase of a project, or one or two reproductive cycles, whichever is longer.
- Long-term impacts are those that last more than two reproductive periods, or as long as the life of the proposed project facilities, depending on the organism or habitat involved.
- Direct impacts are those that occur as a result of construction or operation of the wind park, transmission tie-line, switchyard and all other associated infrastructure including avian or bat collisions with wind turbines or transmission tie-line conductors and overhead groundwires.
- Indirect impacts are those that may occur as a result from new access roads providing increased human accessibility to a previously inaccessible area, or habitat alteration or loss resulting in displacement.

3.2.2.1 Standards of Significance

The proposed project components and alternatives would have a significant and adverse effect on biological resources if they would:

- Adversely affect a listed endangered, threatened, or proposed plant or animal species or designated critical habitat.
- Cause direct impacts to populations which trends toward Federal listing or loss of viability for Forest Service sensitive species
- Result in a long-term loss of vegetation or habitat which leads to the decline of populations and would threaten the continued existence of a plant or animal species.
- Affect the biological viability of a local, regional, or national population of a listed wildlife species or one of concern/interest leading to a downgrading in its listing.
- Violate the ESA, the Bald and Golden Eagle Protection Act, or the MBTA, which all protect Federal- and State-listed species.
- Substantially interfere with the movement of any native resident or migratory fish or wildlife species for more than two reproductive seasons.
- Reduce the value of habitat for fish, wildlife, or plants to an unusable level.
- Cause a native fish or wildlife population to drop below self-sustaining levels.
- Adversely and substantially affect important riparian areas, wetlands, or other wildlife habitats.

3.2.2.2 Foresight's Proposed Project and Proposed Federal Actions

Based on the information presented in the Wildlife and Botanical Report, Site Characterization Report, and Avian and Bat Studies Report it is determined that construction and operation of the proposed wind park, transmission tie-line, and switchyard would result in impacts to biological resources, as described below.

Impacts to Special Status Species

Impacts to Special Status Plant Species

Impacts to special status plant species are broken into two sections: impacts related to the wind park itself, and impacts related to the transmission tie-line and switchyard components of the project.

Impacts to Special Status Plant Species (Wind Park)

The majority of special status plant species have highly restricted distributions and very specific habitat requirements and are not expected to occur within the wind park study area based on either an absence of habitat, range, or distribution. Few records for any of the species evaluated exist for either the biological resources evaluation area or the surrounding two miles evaluated in the Site Characterization Report (see Appendix D). Canyon bottoms containing riparian areas, deciduous woodlands, wetlands, or waterbodies may support wetland and mesic plant species not found within the vast majority of the wind park. Canyon bottoms are not anticipated to be impacted by project facilities or infrastructure; if project-related activities are anticipated in these areas, ground disturbing activities in these areas would be preceded by appropriate plant surveys to ensure sensitive plant species are not present prior to construction. Populations of the species located during pre-construction surveys would be avoided or translocated, if possible, to avoid direct impacts. Indirect impacts to the species would be mitigated, if necessary, following RPMs identified in Table 2.7-1.

No State sensitive plant species are expected to occur in the wind park study area. Of Federal- and State-listed plant species, only the Peebles Navajo cactus (*Pediocaactus peeblesianus* var. *peeblesianus*) was ranked as having moderate potential to occur within the wind park based on availability of habitat and known distribution within the vicinity of the biological resources evaluation area. Field surveys for this species have not occurred. Pre-construction surveys within construction zones, as described in Table 2.7-1, would result in avoidance of direct impacts to the species. Populations of the species located during pre-construction surveys would be avoided or translocated, if possible, to avoid direct impacts. Indirect impacts to the species may be mitigated through habitat restoration, if necessary, following RPMs identified in Table 2.7-1. With application of these measures, adverse direct and indirect impacts would be minimized and applicable biological resources significance standards would not be exceeded.

Impacts to Special Status Plant Species (Transmission Tie-line and Switchyard)

Bebb's willow and Flagstaff beardtongue may occur within the transmission tie-line and switchyard portion of the project, although the lack of water or wetlands and non-suitable soil types would result in an extremely low potential for occurrence, and no impacts to these species are expected. The proposed transmission tie-line and switchyard would not likely effect Bebb's willow because suitable habitat is not present. No riparian habitats are found within or immediately adjacent to the transmission tie-line. The probability of occurrence of Flagstaff beardtongue is considered extremely low due to the absence of limestone-derived soil. The proposed transmission tie-line may have short-term, direct impacts on Flagstaff beardtongue resulting in the loss of individuals during construction, if suitable habitat is available. Soils along the transmission tie-line alignment and within the switchyard area are generally derived from basalt, which are not characterized as suitable for the species; however, locations in the Forest include sites with similar forest characteristics to those found along portions of the transmission tie-line, which include mixed oak and pinyon-juniper woodlands. The transmission tie-line evaluation area does not have evidence of limestone or sandstone outcrops, instead the mesa is built upon a basalt soil foundation. Pre-construction surveys of suitable habitat along the transmission tie-line to identify the species may be warranted as determined by agency consultation. Populations of the species located during pre-construction surveys would be avoided or translocated, if possible, to avoid direct impacts. Indirect impacts to the species would be mitigated, if necessary and possible, following RPMs identified in Table 2.7-1. The switchyard does not contain suitable habitat for this species, and there would be no effect of the switchyard on the species. Therefore, no impacts to special status plant species are expected as a result of construction and operation of the wind park facilities, and impacts which may occur would not be expected to result in impacts to populations.

Impacts to Invasive and Non-native Plant Species (Wind Park and Transmission Tie-line and Switchyard)

Construction of all project elements, including the access roads, wind turbines, wind park infrastructure, transmission tie-line, and switchyard could introduce noxious species to the project area if construction vehicles track contaminated soil from a contaminated area, or if contaminated soil is used in fill areas. Foresight would prepare a Weed Control Plan for the wind park and proposed transmission tie-line that is designed to minimize the spread of non-native and invasive species. The Weed Control Plan would address monitoring and educating personnel on weed identification, and methods for treating infestations. Foresight would ensure that all earth moving equipment brought onto the project area would be cleaned prior to entering the Forest. A high pressure hose should be used to clear the undercarriage, tire treads, grill, radiator, and any other areas where mud and dirt may accumulate. In addition, Western would require its construction contractor to employ similar measures to control noxious species.

Following construction, site restoration activities would begin immediately to further minimize the spread of noxious weeds. Temporary construction areas around project facilities would be restored according to the construction plan and any applicable State or Federal permits. In general, restoration activities would include the removal of excess rock/gravel, re-establishing pre-construction contours, spreading of stockpiled topsoil, and re-vegetation by seeding and mulching.

Best Management Practices identified as *Integrated Weed Management Practices in the Coconino, Kaibab, and Prescott National Forests Noxious and Invasive Weed Strategic Plan 1998, Amended 2002* (Appendix C.2) would be implemented for the construction of the proposed transmission tie-line. For the construction of the proposed switchyard, Western would comply with its approved noxious weed management plan for the Forest. Thus, the spread of invasive and non-native species would be minimized on Forest Service-managed lands and significance thresholds listed in Section 3.2.2.1 would not be exceeded.

Impacts to Special Status Wildlife Species

Impacts to special status wildlife species are described in several sections below—impacts to threatened or endangered wildlife species within or adjacent to the wind park, impacts to bald and golden eagles within or adjacent to the wind park, impacts to other sensitive wildlife species within or adjacent to the wind park, impacts to threatened or endangered wildlife species associated with the proposed transmission tie-line and switchyard, impacts to bald and golden eagles from the proposed transmission tie-line and switchyard, and impacts to Forest Service MIS Species associated with the proposed transmission tie-line and switchyard.

Impacts to Federal Threatened or Endangered Wildlife Species (Wind Park)

The California condor, southwestern willow flycatcher, and the yellow-billed cuckoo all have an extremely low potential to occur within or adjacent to the wind park study area, but may disperse or move through portions of the area. Spotted owls may use the coniferous forest areas along the Anderson Mesa intersected by the proposed transmission tie-line during foraging or dispersal, however suitable habitat also occurs in the surrounding area. Loss of coniferous forest due to construction of the transmission tie-line would occur within small and dispersed patches. These patches are fragmented within the landscape and do not contain high prey density. These patches are not undisturbed by human activities relative to the surrounding landscape.

It is unlikely that spotted owls would hunt within or disperse through the wind park Study Area due to the absence of suitable habitat. At the request of Western, WEST conducted a review of publically available data from post-construction wind-energy monitoring studies to search for records of Mexican spotted owl

fatalities resulting from operation of WTGs. A total of 95 post-construction studies were reviewed by WEST to check for records of Mexican spotted owl collisions and zero fatalities were reported during these studies. It is important to note that not all studies were located within Mexican spotted owl range; however, the review was intended to be comprehensive for all current publically available fatality data. To minimize and mitigate risk of potential avian collisions and electrocutions along the proposed transmission tie-line and any other wind park overhead transmission or distribution lines, APLIC's Suggested Practices for Avian Protection on Power Lines (APLIC 1994, 2006) would be followed.

Impacts to Bald and Golden Eagles (Wind Park)

Bald Eagles

No habitat for the species would be directly affected by the wind park; therefore, no indirect impacts are anticipated. Nest surveys completed by Foresight during Spring 2011 within 10-miles of the wind park (Tidhar et al. 2011a) and information obtained from the AGFD (May 2011) conclude that no nest sites are located within this survey area. However, individuals may pass through the area as transients or during movement between foraging areas and may use transmission tie-line structures for perching. Most over-flights are predicted to occur during the Winter and Fall migration season based on existing information from surveys completed within the area (Young et al. 2009 and WEST 2006). To date, only two bald eagle fatalities have been reported at existing wind energy facilities in North America (Pearce 2010; Sharp et al. 2010). The greatest risk to the species from construction and operation of the wind park is likely direct impacts resulting from collision with overhead transmission lines. As a result, there remains a low risk of collision with or electrocution from any above ground transmission lines which may result in direct impacts to individuals. To minimize and mitigate risk of potential avian collisions and electrocutions along the proposed transmission tie-line and any other wind park overhead transmission or distribution lines, APLIC's Suggested Practices for Avian Protection on Power Lines (APLIC 1994, 2006) would be followed. An Avian and Bat Protection Plan (ABPP) would be implemented at the wind park in addition to post-construction monitoring. A post-construction monitoring study would be implemented to monitor the overall level of fatalities resulting from operation of the proposed wind park. In addition to the RPMs in the Draft and Final EIS, the ABPP will include a toolbox of operational practices and/or compensatory measures; individual practices would be implemented as needed if post-construction monitoring demonstrates that impacts are greater than anticipated. Data collected during final design and post-construction from the initial phase would be used to help inform design and operations of later phases. With implementation of these RPMs (which include the ABPP) during construction and operation, impacts to the bald eagle would be minimized and the significance thresholds in Section 3.2.2.1 would not be exceeded. The specific RPMs are listed in Section 2.7, Table 2.7.1.

Golden Eagles

Golden eagle breeding habitat is found along canyon edges within and adjacent to the wind park study area. During nest surveys completed in 2011, however, one occupied golden eagle nest site was documented within 10-miles of the wind park study area and all proposed project components, and this nest was not located within Diablo or Grapevine canyons. Unoccupied golden eagle nest sites were documented within the wind park study area during raptor nest surveys completed during 2008 and 2011, as referenced above. The potential exists for indirect effects to the species resulting from construction and operation of the wind park. Consequently, to minimize and mitigate risk of indirect impacts to golden eagles, RPMs included in the Draft EIS have been expanded and refined in the Final EIS. These RPMs would be implemented for facility planning, construction activities, resource monitoring, and development of an ABPP, which will include an Adaptive Management Plan with post-construction monitoring that will inform operations and micro-siting of all subsequent phases.

Studies indicate that raptor mortality at wind-energy facilities (for example, Altamont Pass Wind Resource Area [APWRA], California) may be in part due to behavioral differences between species, increasing the susceptibility of some for collision with turbines. Orloff and Flannery (1992, 1996) suggested that high golden eagle mortality at APWRA was in part due to the apparently high densities of ground squirrels (*Spermophilus beecheyi*) in the area (Thelander and Smallwood 2007). Continued research at the site revealed that the degree of aggregation of pocket gopher (*Thomomy bottae*) burrows around the turbines was positively correlated to red-tailed hawk fatality rates (Smallwood et al. 2001; Thelander et al. 2003; Thelander and Smallwood 2007). In addition, features providing cover for cottontails (*Sylvilagus auduboni*) appeared to be associated with areas where golden eagles were killed. Site-specific surveys to document prey availability were completed within the wind park Sub-study Area A during 2008 and within sub-study areas A, B, and C in 2011 (Tidhar et al. 2011a). Less than one percent of the wind park study area contains colonial prey. The low level of golden eagle use observed during 2007–2008 avian use surveys was not strongly correlated with avian use points situated near or within prey concentration areas. Nonetheless, to minimize risk of golden eagle collision in areas containing concentrated prey availability, wind turbine generators and infrastructure would not be located in prairie dog towns identified during site-specific surveys completed prior to construction for the initial or build-out phases. Pre-construction sensitive species surveys will ensure that site conditions and resources are documented and reflected in final micro-siting of the facilities prior to land disturbance.

Several comments on the Draft EIS referenced various recommendations for seasonal, and specific types of, surveys and two years of biological inventories or pre-construction surveys. Following the 2007–2008 baseline study (Young et al. 2009), additional surveys were implemented at the wind park study area (including Tidhar et al. 2011a, 2011b). A total of two years of pre-construction surveys will be completed within the initial build out phase prior to construction. Study findings are being discussed with USFWS and AGFD and will be included in development of the ABPP. The initial phase includes wind generation turbines, transmission tie-line, interconnection switchyard, step-up substations, operations and maintenance facility, primary site access road, service roads and collector lines. Subsequent phases would construct additional wind turbines, service roads, and collector lines. For the subsequent phases, the surveys completed to date provide adequate information for the Western and Forest Service decisions relative to the switchyard interconnection and the right-of-way use permit. Additional pre-construction surveys will be conducted on the build-out phase areas so that a total of two years of pre-construction surveys will be completed prior to construction of subsequent phases. The results of those additional surveys will inform a refined preliminary layout plan for those phases of the wind park and will be incorporated into the ABPP in consultation with USFWS and AGFD.

Low numbers of golden eagles have been documented during site-specific surveys year-round at the wind park. Direct impacts resulting from construction or operation of the wind park would be below the EIS significance standards and would not result in affects to the biological viability of the local, regional, or national population leading to a downgrading in its listing. However, there is a risk of the loss of individuals resulting from collisions with wind turbine generators. As a consequence, Foresight is working with the USFWS to develop, as part of the ABPP, a list of operational practices and compensatory mitigation options to provide a template for operational refinements and/or compensation in the event that fatalities result in increases in the level of impact identified in the EIS Post-construction biological resource monitoring would provide scientifically credible data from which refinements to operational practices may be developed through the Adaptive Management Plan. Post-construction mortality monitoring would be conducted to monitor bird fatality rates resulting from operation of the wind park and determine if any changes to the operational practices should be considered. Data collected during final design and post-construction from the initial phase would be used to help inform design and operations of later phases. With implementation of the RPMs (see Table 2.7-1) during construction and operation, impacts to the golden eagle would be minimized and significance thresholds would not be exceeded.

Impacts to Federal Threatened or Endangered Wildlife Species (Transmission Tie-Line and Switchyard)

Mexican Spotted Owl

The transmission tie-line contains low quality potential foraging habitat and is located within the species range. There is low risk of collision with overhead electrical transmission lines during flight. Implementation of RPMs, as well as in the ABPP being developed for the project, would minimize and mitigate the likelihood of bird collisions with the transmission tie-line. Minimization measures designed to reduce the risk of Mexican spotted owl collision with overhead electrical transmission lines include implementation of the APLIC standards (1994 and 2006).

Western believes that the proposed transmission tie-line, switchyard, and any overhead collection lines may affect, but is not likely to adversely affect, the interior populations of the Mexican spotted owl. Negative affects to the Mexican spotted owl are not anticipated to result from construction or operation of the wind park. No habitat for the species would be directly affected by the proposed Federal actions. Mexican spotted owls are not known to nest in, or immediately adjacent to, the transmission tie-line or switchyard and there have been no observations of the species in these areas or the immediately surrounding region based on publically available information from the AGFD, USFWS, and Forest Service (Appendix A) (Tidhar et al. 2010a). Coniferous forest components of the transmission tie-line or switchyard have extremely low or no potential to support nesting Mexican spotted owls due to: a) existing disturbance or land use conditions such as existing transmission lines or roads which decrease the probability for nest sites to be located within these areas, and b) sparse and low density of mature ponderosa pine stands within these areas. Spotted owls may use the coniferous forest areas along the Anderson Mesa intersected by the proposed transmission tie-line during foraging or dispersal, however suitable habitat also occurs in the surrounding area. Loss of coniferous forest due to construction of the transmission tie-line would occur within small and dispersed patches. These patches are fragmented within the landscape and do not contain high prey density. These patches are not undisturbed by human activities relative to the surrounding landscape. Individual spotted owls may pass through the transmission tie-line for foraging or between foraging areas. These individuals may be at risk for collision with the proposed transmission tie-line. To minimize and mitigate risk of potential avian collisions and electrocutions along the proposed transmission tie-line and any other wind park overhead transmission or distribution lines, APLIC's Suggested Practices for Avian Protection on Power Lines (APLIC 1994, 2006) would be followed. There are no records for transmission tie-line collision fatalities for the species within the Forest. Therefore, impacts to the species from existing transmission lines have not been observed, and the likelihood that the proposed action would increase collision risk to the species is unlikely, particularly as the transmission tie-line does not occur in breeding habitat or within an area known to concentrate the species.

Impacts to Bald and Golden Eagles (Transmission Tie-Line and Switchyard)

No habitat for the two species would be directly affected by the proposed transmission tie-line or switchyard as there is limited breeding habitat for either species in these areas and the immediate surrounding area; therefore, no indirect impacts are anticipated. Nest surveys completed by Foresight during Spring 2011 within 10 miles of the transmission tie-line and switchyard (Tidhar et al. 2011a) and information provided by the AGFD (May 2011) conclude that no nest sites are located within the vicinity of the transmission tie-line and switchyard. However, individuals may pass through the area as transients or during movement between foraging areas and may use transmission tie-line structures for perching. Most overflights of the transmission tie-line and switchyard are predicted to occur during the Winter and Fall migration season based on existing information from surveys completed within the area (Young et al. 2009; WEST 2006). There is low risk of electrocution of bald or golden eagles associated with the 345-kV rated transmission tie-line and switchyard due to the large spacing of energized components, which

exceeds recommended spacing (APLIC 2006). There remains a low risk of collision with the transmission tie-line which may result in direct impacts to individuals (APLIC 1994). To minimize risk of potential avian collisions and electrocutions along the proposed transmission tie-line and any other wind park overhead transmission or distribution lines, APLIC's Suggested Practices for Avian Protection on Power Lines (APLIC 1994, 2006) would be followed. With implementation of APLIC practices impacts to bald and golden eagles would be minimized and the significance thresholds in Section 3.2.2.1 would not be exceeded and impacts would not affect the biological viability of the population.

Impacts to Other Sensitive Wildlife Species (Transmission Tie-Line and Switchyard

American Peregrine Falcon

Construction and operation of the transmission tie-line and switchyard may result in direct impacts through collision with power lines and/or electrocution. The risk of collision is considered extremely low because the transmission tie-line would not be located in breeding or foraging habitat and the species occurs at extremely low density in the region, primarily during migration seasons. Construction and operation of the proposed transmission tie-line and switchyard may result in direct impacts to the American peregrine falcon, but is not likely to result in a downward trend toward Federal listing. Peregrine falcons are known to hunt waterfowl concentrated at seasonal wetlands occurring throughout Anderson Mesa. Several of these wetlands are located within the transmission tie-line evaluation area; however, no wetlands exist immediately adjacent to the transmission tie-line, and no potential peregrine falcon foraging habitat would be impacted by the proposed transmission tie-line and switchyard, therefore, no indirect impacts are anticipated. There remains, however, a very low risk for peregrine falcons flying between foraging areas or during migration to collide with the proposed transmission tie-line which could result in the fatality of individuals. Following guidance of the APLIC Suggested Practices for Avian Protection on Power Lines (2006) would minimize and mitigate risk of potential avian collisions and electrocutions along the proposed transmission line and any other overhead transmission lines associated with the wind park. An ABPP would be implemented in addition to post-construction monitoring. Biological resource monitoring would provide scientifically credible data from which refinements to the Adaptive Management Plan[3] may be developed. As a result of these RPMs (refer to Table 2.7-1), impacts would be minimized and significance standards would not be exceeded.

Allen's Lappet-Browed Bat

The Allen's lappet-browed bat has a high potential to occur within or adjacent to the proposed transmission tie-line alignment. However, caves and mines used by the species for roosting are not presently adjacent to the transmission tie-line and switchyard, therefore, no breeding habitat or important hibernation areas would be affected. While the species is not listed by the AGFD as occurring within five miles of the proposed wind park, the bat has been documented within the Canyon Diablo Watershed, in which the transmission tie-line occurs, and is capable of ranging over long distances during foraging or migration. Suitable woodland habitat is present within the biological resources evaluation area, and a few loose-bark mature ponderosa pine snags are present in the area. There is extremely low potential for the species to roost within these snags during the maternity season, and low potential for the species to occur during the migration or maternity seasons. There is low risk that construction of the transmission tie-line or switchyard could result in the loss of individuals roosting within suitable snags during the maternity

[3]An Adaptive Management Plan would be implemented at the project whereby iterative decision-making (evaluating results and adjusting actions on the basis of what has been learned) would be undertaken to reduce impacts to biological resources. Adaptive Management may also be refined based upon observed impacts which have been documented as occurring at the project. Data collected during monitoring studies or facility operation would be used to refine the Adaptive Management Plan. Adaptive Management may involve consultation with experts, consultants, agency personnel, landowners, and other stakeholders or may also be developed internally by Foresight and implemented proactively.

season. Avoidance of these snags and/or avoidance of construction clearing during the maternity season are measures included in the RPMs (see Table 2.7-1) and, therefore, no direct effects to the species are anticipated, and significance standards listed in Section 3.2.2.1 would not be met.

Greater Western Mastiff Bat

High quality roost habitat for the species, generally characterized as rock crevices with vertical drop of 10 feet or more (AGFD 2009), is not believed to occur within the transmission tie-line right or way and is absent from the switchyard. Therefore, direct impacts to habitat are not anticipated for the greater western mastiff bat. The species may forage in the vicinity but is not anticipated to be affected by construction or operation of the transmission tie-line or switchyard.

Merriam's Shrew

The proposed transmission tie-line and switchyard would result in a loss of habitat for the Merriam's shrew. There is very limited amount of dry forest habitat suitable for the species within or adjacent to the transmission tie-line alignment or switchyard. The transmission tie-line and switchyard would remove less than 10 acres of dry coniferous forest habitat potentially used by the species, but this small amount of lost habitat would not result in loss of species viability. The construction and operation of project facilities is not likely to result in direct impacts which would lead toward a downward trend toward Federal listing. Construction operations may result in the destruction of individual burrows or loss of individuals, however, construction operations would be short-lived and operation of the transmission tie-line would have no long-term effect on the species.

Pale Townsend's Big-Eared Bat

Construction and operation of the proposed transmission tie-line and switchyard would have no direct effects to the pale Townsend's big-eared bat. Suitable habitat for the species in the form of caves and mines for roosting and large ponds for drinking are not present adjacent to the transmission tie-line alignment or the switchyard. The species may pass through the transmission tie-line in transit between wetland foraging areas and roost sites in the surrounding region, but habitat for pale Townsend's big-eared bat would not be impacted by the proposed transmission tie-line or switchyard. Impacts to this species would be minimal and applicable significance thresholds would not be exceeded.

Impacts to Forest Service MIS Species

Forest Service MIS that may be impacted by the proposed transmission tie-line and switchyard include the juniper titmouse, elk, mule deer, and pronghorn antelope. Discussion of expected impacts to elk, mule deer, and pronghorn antelope are described in the Big Game section and in detail in Appendix D.2.

The proposed transmission tie-line may have indirect impacts on juniper titmouse, although impacts would be small and would not be expected to affect overall habitat on Forest Service managed lands or population trends for the species. While the proposed transmission tie-line would remove some pinyon-juniper woodland (up to approximately 233 acres), this incremental loss is minor to the overall amount of pinyon-juniper woodland on the Coconino National Forest (estimated at more than 630,000 acres). This habitat type is abundant in the region and not a unique habitat feature. Construction, depending on timing, may result in the loss of individual juniper tit mouse nests or the mortality of individuals. Avoidance of direct impacts would be accomplished through restricting clearing operations conducted as part of construction during the breeding season. Resulting direct and indirect impacts would not result in impacts to Forest-wide population and habitat trends and would not exceed significance thresholds defined in Section 3.2.2.1.

Impacts to Breeding and Migratory Birds(Wind Park)

The most probable impact to birds from wind projects is direct mortality or injury due to collisions with turbines (NWCC 2010; Strickland et al 2011). Collisions may occur with resident birds foraging and flying within the project area or with migrant birds seasonally moving through the area. Substantial data on bird mortality at wind-energy facilities are available from studies in California and throughout the west and Midwest. However, there is currently a lack of data on bird mortality from comparable wind projects operating in Arizona, northern New Mexico, Utah, central and southern Nevada, or southern Colorado—areas which contain similar habitats and biological communities to the wind park study area. Only one commercial wind-energy project has been constructed in Arizona, and data from wildlife monitoring studies conducted to estimate fatality rates at the project (Dry Lake I Wind Project) were recently made public (Thompson et al. 2011). No raptor fatalities were found at the Dry Lake I Wind Project during 2010. Other monitoring studies closest to the wind park study area are located in California. Of 841 bird fatalities reported from California studies (greater than 70 percent from APWRA in California), 39 percent were diurnal raptors, 19 percent were passerines (excluding house sparrows [*Passer domesticus*] and European starlings [*Sturnus vulgaris*]), and 12 percent were owls. Non-protected birds, including house sparrows, European starlings, and rock doves (*Columba livia*), comprised 15 percent of the fatalities. Other bird types generally made up less than 10 percent of the fatalities (Erickson et al. 2002). During 12 fatality monitoring studies conducted outside of California, diurnal raptor fatalities comprised 2 percent of the fatalities and raptor mortality averaged 0.03 per turbine per year. Passerines (excluding house sparrows and European starlings) were the most common collision victims, comprising 82 percent of the 225 fatalities documented. For all bird species combined, estimates of the number of bird fatalities per turbine per year from individual studies ranged from zero at the Searsburg, Vermont (Kerlinger 1997) and Algona, Iowa facilities (Demastes and Trainer 2000) to 7.7 at the Buffalo Mountain, Tennessee facility (Nicholson 2003). Using mortality data from the last 12 years from wind projects throughout the entire United States, the average number of bird collision fatalities is less than four birds per MW per year (NWCC 2010).

Exposure indices of non-raptors indicate that unidentified swallow, raven, and pinyon jay are most likely to be exposed to potential collision with wind turbines at Sub-study Area A. Despite relatively high use and exposure, common ravens are rarely reported as fatalities according to monitoring studies at other wind-energy facilities (Erickson et al. 2001; 2002). At the Tehachapi Pass wind-energy facility in California, common ravens were found to be the most common large bird in the wind resource area, yet no fatalities for this species were documented during intensive studies (Anderson et al. 1996). Most non-raptors had relatively low exposure indices due to the majority of individuals flying below the zone of risk.

Predicting numbers of fatalities at wind energy projects in the desert southwest is difficult in large part due to the lack of monitoring studies in these environments. However, due to generally low known impacts for western wind projects, including the Dry Lake I Wind Project, and the low exposure risks at the wind park study area, it is unlikely that non-raptor populations would be affected by direct mortality from the operation of the wind-energy facility, and any impacts would be at the individual level and not at the population level. Estimated bird fatality rates at the Dry Lake I Wind Project were considered low to moderate and well within the range of other similar studies conducted in the Western U.S. and Rocky Mountain Regions (Thompson et al. 2011). Of the 24 birds that were found and identifiable to species, none were Federally protected under the ESA.

During migration, bird species within the wind park study area are at risk of turbine-collision; however, previous studies of Sub-study Area A (Young et al. 2009) do not suggest these species migrate in abundance over that portion of the wind park study area. RPMs as described in Table 2.7-1 would include construction requirements, post-construction monitoring and reporting requirements, and

operational practices. Also, iterative operational practices aspects of the proposed ABPP, including an impact assessment for birds protected under the MBTA, would help address any take of migratory birds. This proactive approach would help ensure that the proposed wind park would be in compliance with the MBTA, and applicable significance thresholds defined in Section 3.2.2.1 would not be exceeded. Breeding bird species found at Sub-study Area A during 2007–2008 avian surveys (Young et al. 2009) do not suggest the potential for breeding rare or sensitive bird species within the wind park study area. Pre-construction raptor nest surveys would be conducted for the Spring or appropriate season immediately preceding construction in order to provide data on the location of raptor nest structures throughout the wind park project area so that project planning may be informed by the location of nesting raptors. Actions would be taken to help ensure no migratory birds, their nests, or nest contents would be harmed during construction (see RPM in Table 2.7). With the proposed pre-construction measures, effects on breeding rare or sensitive species within the wind park are not anticipated.

Breeding in the grassland and pinyon-juniper habitat are likely to be displaced from construction zones during the breeding season but the overall loss of habitat is not expected to be substantial and over time would be reduced as construction areas revert to native habitat. Results from studies at the Stateline wind-energy facility in Oregon and Washington (Erickson et al. 2004) and the Combine Hills facility in Oregon (Young et al. 2005) suggest a relatively small-scale impact of wind-energy facilities on grassland steppe nesting passerines. Transect surveys conducted prior to and after construction of the facilities indicated that grassland passerine use was significantly reduced within approximately 164 feet of turbine strings; areas further away from turbine strings did not have reduced bird use. The reduced use was attributed to temporary and permanent habitat loss/disturbance near the turbines. While it is likely that similar impacts would occur at the Grapevine Canyon Wind Park, the species subject to these impacts are typically common in grassland and pinyon-juniper habitats, but the impacts are not expected to exceed the significance thresholds.

Large numbers of songbirds have collided with lighted communication towers and buildings when foggy conditions and Spring or Fall migration coincide (Winkelman 1995; Manville 2009; NWCC 2010). Birds appear to become confused by the lights during foggy or low ceiling conditions, flying circles around lighted structures until they become exhausted or collide with the structure (Erickson et al. 2001). Most collisions at communication towers are attributed to the guy wires on these structures which wind turbines do not have. No large mortality events on the same scale as those seen at communication towers have been documented at wind energy facilities in North America (NWCC 2010). Additionally, the large mortality events observed at communication towers occurred at structures greater than 150 meters in height (Erickson et al. 2001), likely because most species of birds migrate at elevations of 270 meters or higher (Young et al. 2004; Young and Erickson 2006). Modern wind turbines are below 270 meters in height.

Migrants may be more vulnerable to wind turbine collision in locations that contain important stopover habitat and are sited with wind turbine generators. In such situations risk of avian collision with turbines may be elevated during take-off or landing from stopover habitat. The seasonal migration of birds through Arizona is thought to occur in a broad front throughout much of the state. The wind project study area contains a limited amount of stopover habitat for songbirds, waterfowl, and shorebirds in the forms of grassland, shrubland, pinyon-juniper woodland, and a few waterbodies; migrating birds utilize these areas during migration (Young et al. 2009).

Wind parks with year-round waterfowl use have shown the highest waterfowl mortality, although levels of waterfowl/waterbird mortality appear insignificant compared to use of the sites by these groups. The Top of Iowa Wind Farm is located in cropland between three Wildlife Management Areas (WMAs) with historically high use by migrant and resident waterfowl. During a recent study, approximately one million total goose-use days and 120,000 total duck-use days were recorded in the WMAs during the Fall

and early Winter, and no waterfowl fatalities were documented during concurrent and standardized wind project fatality studies (Koford et al. 2005). Similar findings were observed at the Buffalo Ridge Wind Project in southwestern Minnesota, which is located in an area with relatively high waterfowl use. Snow geese (*Chen caerulescens*), Canada geese (*Branta Canadensis*), and mallards (*Anas platyrhynchos*) were the most common waterfowl observed. Three of the 55 fatalities observed during the fatality studies were waterfowl, including two mallards and one blue-winged teal (*Anas discors*) (Johnson et al. 2002).

Studies assessing the relative proportion of wind-energy collisions compared with other sources of anthropogenic mortality indicate that wind-energy impacts account for a small proportion of overall bird fatalities associated with human activities in North America (Erickson et al. 2003, 2005). Bird species that migrate long distances or at night are more likely to be killed by collisions with man-made structures (NWCC 2010; Arnold and Zink 2011) than year-round residents or diurnal migrants. However, a recent study (Arnold and Zink 2011) concluded that there was no correlation between relative collision mortality of selected bird species with man-made structures (WTGs, windows, communication towers, vehicles, etc.) and long-term population trends.

Of the non-raptor avian groups, passerines have been the most abundant avian fatality at newer generation wind facilities, often comprising more than 80 percent of the avian fatalities (Erickson et al. 2001). Both migrant and resident passerine fatalities have been observed. Based on species and date information, in some studies up to 70 percent of fatalities found were believed to be migrants (Howe et al. 2002); however, the estimates are highly variable and range from 0 to 70 percent. In general, the number of migrant fatalities is higher in wind projects in the eastern U.S. (Erickson et al. 2002). The overall national average for passerine fatalities at wind projects has been approximately 2.2 birds per turbine per year (Erickson et al. 2002). The annually adjusted fatality rate for all birds at the Dry Lake I Wind Project in eastern Arizona was 4.66 bird fatalities per turbine per year, or 2.21 bird fatalities per MW per year (Thompson et al. 2011).

A post-construction monitoring study would be implemented to determine the overall level of bird fatalities resulting from operation of the proposed wind park. In addition, avian and bat protection measures would be developed prior to construction to mitigate potential direct impacts to birds. RPMs would include construction requirements, post-construction bird monitoring and reporting requirements, and operational practices. With the iterative operational practices aspects of the proposed ABPP, the proposed project would minimize impacts to birds and applicable significance standards for birds would not be exceeded.

Impacts to Raptors (Wind Park)

Young et al. (2009) compared annual mean raptor use at Sub-study Area A with 36 other proposed or existing wind-energy facilities that implemented similar protocols and had data for three or four seasons. The annual mean raptor use at these facilities ranged from 0.09 birds per 20-minute survey to 2.34 birds per 20-minute survey. Mean annual raptor use at Sub-study Area A was 0.67 birds per 20-minute survey which is in the mid-range of all the sites studied. Raptor use at the nearby proposed Sunshine Wind Park was lower than that observed at Sub-study Area A in 2007–2008, with a peak seasonal use of 0.58 observed during the Fall, while Winter use was only 0.08 raptors observed, per 30-minute fixed point survey (WEST 2006).

Results from Altamont in California suggest that mortality for some species is not related to abundance (Orloff and Flannery 1992). American kestrels, red-tailed hawks, and golden eagles were killed more often and turkey vultures were killed less often than predicted based on abundance estimates. A recent report from the Buffalo Gap wind-energy facility in Texas, however, suggests that turkey vultures may show higher susceptibility to collision at larger wind turbines than previously believed for smaller

turbines (Tierney 2007). Also, reports from the High Winds wind-energy facility in California document high American kestrel mortality. Relative use by this species at High Winds is six times that at the Altamont (Kerlinger 2005). It is likely that many factors, in addition to abundance, are important in predicting raptor mortality.

A high density of small mammal prey and the conditions favorable to high prey densities (Smallwood and Thelander 2004) have often been presumed to be the main factors responsible for the high raptor use. High prey densities relative to the surrounding landscape are not estimated to occur within the study area. Prairie dog colonies are believed to be most prevalent within Sub-study Area A, relative to other portions of the biological evaluation area (Appendix D.1). Use by raptors observed at Sub-study Area A was highest adjacent to prairie dog towns. Therefore, risk to raptors may be highest within portions of Sub-study Area A associated with prairie dog towns and decreased within other portions of the evaluation area. For comparison, the results of avian use surveys conducted at the proposed Sunshine Wind Park, which is located nearby and in similar habitats to Sub-study areas B and C of the proposed wind park, help substantiate this risk to raptors. Raptor use at the Sunshine Wind Park was estimated at 0.26 birds per 20-minute survey during Fall, Winter, and Spring (WEST 2006). Based on this information it is unlikely that the raptor use estimate derived at Sub-study Area A would be as high in other portions of the biological evaluation area (Sub-study areas B and C). In addition, siting of WTGs would avoid prairie dog towns (see Resource Protection Measures Table 2.7-1).

Exposure indices may provide some insight into what species might be the most likely turbine casualties based on site specific data on abundance and flight behavior. The index considers relative probability of exposure based on abundance, proportion of activity recorded as flying, and observed flight height of each species. The analysis is based on observations of birds made during the studies and does not take into consideration varying ability among species to detect and avoid turbines, habitat selection, or other factors that may influence exposure to turbines such as breeding or hunting behavior. Thus, the actual risk may be lower or higher than indicated by these data. Based on this analysis, turkey vultures had the highest relative exposure index among raptors followed by red-tailed hawks at Sub-study Area A (Young et al. 2009). While turkey vulture and red-tailed hawk casualties have been recorded at wind projects, they are generally not found in proportion to relative abundance. For example, at Altamont red-tailed hawk casualties were found more often and turkey vultures less often than predicted based on abundance (Orloff and Flannery 1992). Altamont contains approximately 5,400 turbines, most of which are small, older, lattice tower turbines which are not necessarily representative of new wind facilities. The latest raptor fatality estimates at Altamont, based on searches using 30–90 day search intervals, indicate that annual mortality averages 1.5 to 2.2 raptor fatalities per MW when adjusted for searcher efficiency and scavenging bias (Smallwood and Thelander 2004). This estimate is higher than estimates of raptor mortality at modern wind farms (Erickson et al. 2001; NWCC 2010). No raptor fatalities were documented at the Dry Lake I Wind Project during post-construction monitoring studies conducted during 2009–2010 (Thompson and Bay 2011). It consists of thirty 2.1 MW turbines and is located approximately 47 miles west of the wind park study area. This facility is the closest operational wind energy site to the wind park study area and post-construction fatality monitoring data recently became public (Thompson et al. 2011).

Based on species composition of the most common raptor fatalities at other western wind-energy facilities, species composition of raptors observed during field surveys, and considering the exposure indices calculated, the diurnal raptors at the wind park study area most likely at risk of turbine collision would be red-tailed hawk and American kestrel. Small numbers of fatalities of other raptors, including other falcons, accipiters, and northern harriers, may also occur over the life of the wind-energy facility, but are expected to be rare. Based on the seasonal use estimates, it is also expected that risk to raptors would be unequal across seasons with the lowest risk in the Winter, when very few raptors were observed, and highest during the Fall season, likely due to migrants passing through the area.

A post-construction monitoring study would be implemented to determine the overall level of raptor fatalities resulting from operation of the proposed wind park. In addition, avian and bat protection measures would be developed prior to construction to mitigate potential direct impacts to raptors. RPMs would include construction requirements, post-construction raptor monitoring and reporting requirements, and operational practices. With the iterative operational practices aspects of the proposed ABPP, the proposed project would minimize impacts to raptors and applicable significance standards for raptors would not be exceeded.

Some resources are considered more sensitive to indirect impacts such as disturbance or displacement, including nesting raptors and other sensitive species. Indirect effects caused by disturbance-type impacts, such as construction activity near an active nest or primary foraging area, have the potential to impact raptor species. Birds displaced from the wind-energy facility might move to areas with fewer disturbances, but lower quality habitat, with an overall effect of reducing breeding success. There have been few studies on raptor displacement at wind-energy facilities, and most of these have suggested indirect effects to be negligible or immeasurable (Howell and Noone 1992; Johnson et al. 2000; Madders and Whitfield 2006). In general, due to the low density of nesting raptors based on survey data (Young et al. 2009; Tidhar et al. 2011a), there is limited potential for nesting displacement of raptors at the proposed wind park. Observation of a no-disturbance buffer around known nests when siting turbines would further minimize potential for impact. Disturbance or displacement related impacts are expected to be minimal and significance thresholds would not be exceeded.

Impacts to Migratory and Breeding Birds, Including Raptors (Transmission Tie-line and Switchyard)

Bird species protected under the MBTA may be affected by the proposed transmission tie-line both directly and indirectly. Collisions may occur with resident birds foraging and flying within the project area or with migrant birds seasonally moving through the area. While construction and maintenance of the transmission tie-line would likely result in disturbance to and removal of habitat for some species, particularly those inhabiting grassland and pinyon-juniper woodland habitats within or adjacent to the transmission tie-line and switchyard, the total area impacted would be relatively small compared to surrounding similar habitat and construction activities would be short-term. The major habitat types that would be impacted by the transmission tie-line and switchyard are abundant throughout the region and are not unique habitat features. Thus, removal of habitat for construction of the transmission tie-line and switchyard is not expected to have impacts on resident and migratory birds that exceed the significance thresholds in the region since the removal would not substantially interfere with the movement of any migratory species for more than two reproductive seasons. To minimize and mitigate risk of potential avian collisions and electrocution, the transmission tie-line and any overhead collection lines would be designed according to APLIC's recommendations (APLIC 1994, 2006). Thus, the effects would not result in a downward trend toward Federal listing for any of the migratory species. In addition, the iterative operational practices aspects of the proposed ABPP would help address any take of migratory birds. Implementation of these RPMs would minimize project related impacts and help ensure that the proposed transmission tie-line would be in compliance with the MBTA. Applicable significance thresholds for migratory birds and raptors would not be exceeded.

Bird species inhabiting the Anderson Mesa IBA may be affected by the proposed transmission tie-line. While several smaller lakes do occur, none occur within or immediately adjacent to the transmission tie-line or switchyard. Larger lakes in the region (Lake Mary and Mormon Lake) are located over three miles from the proposed transmission tie-line alignment. The transmission tie-line and switchyard would be constructed across grasslands and pinyon-juniper woodlands which are important land cover components of the Audubon Society's IBAs; however, both of these habitat types are abundant throughout the Anderson Mesa and are not unique habitat features to the region. Thus, the removal of habitat for construction of the transmission tie-line and switchyard is not expected to affect the biological

viability on resident and migratory birds in the region. While avian collision with the proposed transmission tie-line would remain an unavoidable risk, particularly for waterfowl species utilizing wetland areas adjacent to the transmission tie-line, implementation of the APLIC standards and the ABPP would serve to minimize this potential threat. Based on these measures and the small amount of habitat loss, the proposed project would not result in a downward trend toward Federal listing for migratory species.

Impacts to Bats (Wind Park)

Due to the current lack of understanding of bat populations in North America, the species and relative abundance of bats occurring within the wind park are difficult to determine. During acoustic bat monitoring conducted by WEST at Sub-study Area A of the proposed project in 2007 and 2008, bat activity (mean = 9.11 bat passes per detector-night) was relatively high compared to that observed at facilities in Minnesota and Wyoming where bat collision mortality was low, but it was much lower than activity recorded at sites in West Virginia and Tennessee where bat mortality rates were high. Bat activity at the nearby proposed Sunshine Wind Park was considerably lower with a mean of 2.48 bat passes per detector night (Gruver et al. 2009), suggesting decreased bat activity may occur in grassland and desert scrub areas associated with large portions of Sub-study areas B and C compared with observed detections in Sub-study Area A. No known bat hibernaculum or roosts of importance have been noted within the vicinity of the wind park study area by the AGFD or the USFWS.

Bat activity recorded by fixed ground detectors within the Dry Lake I Wind Project was 8.83 ± 0.76 bat passes per detector-night. Based on the expected relationship between pre-construction bat activity and post-construction fatalities, bat fatality rates at the Dry Lake I Wind Project would be expected to be similar to the fatality estimates at Summerview, Alberta, and Blue Sky Green Field, Wisconsin, which ranged between 14.62 and 24.57 bat fatalities per MW per study period. However, the actual fatality estimate for the Dry Lake I Wind Project was 4.29 bat fatalities per MW per year. This annually adjusted bat fatality rate would be considered moderate and well within the range of other similar studies conducted in the Western and Rocky Mountain Regions. These results imply that a different relationship between activity and fatality may exist in the desert Southwest.

Other western projects including those in California have generally shown relatively low impacts. The recently published Dillon, California fatality project showed a bat fatality rate of 2.17 fatalities per turbine per year (2.17 fatalities per MW per year) (Chatfield et al. 2009). A post-construction monitoring study would be implemented to determine the overall level of bat fatalities resulting from operation of the proposed wind park. In addition, avian and bat protection measures would be developed prior to construction to mitigate potential direct impacts to bats. RPMs would include construction requirements, post-construction bat monitoring and reporting requirements, and operational practices. With the iterative operational practices aspects of the proposed ABPP, the proposed project would minimize impacts to bats and applicable significance standards for bats would not be exceeded.

No known bat hibernacula of importance have been noted within the vicinity of the wind park study area by the AGFD or the USFWS; however, formal surveys have not been completed in this area by the project company or the AGFD to search for bat hibernacula. Arizona contains few documented hibernacula (10) and the wind park is not situated in an area which would be likely to contain large hibernacula relative to the surrounding region. Features with the highest probability of containing bat roosts or hibernacula (rocky features with caves or crevices such as canyon walls, large snags, or loose bark trees) are being avoided by the project. Field surveys conducted during Summer 2011 within the wind park study area (Tidhar et al. 2011b) identified an abandoned house which was occupied by roosting bats. This abandoned house is not located within the vicinity of wind turbines or other infrastructure proposed for the project and would be avoided.

Impacts to Bats (Transmission Tie-Line and Switchyard)

No known bat hibernacula or roosts of importance have been noted within the vicinity of the transmission tie-line or switchyard by the AGFD or the USFWS; however, formal surveys have not been completed in this area by the project company or the AGFD to search for bat hibernacula or roosts. Arizona contains few documented hibernacula (10) and the transmission tie-line is not situated in an area that would be likely to contain large hibernacula relative to the surrounding region. Features with the highest probability of containing bat roosts or hibernacula (rocky features with caves or crevices such as canyon walls, large snags, or loose bark trees) are rare along the transmission tie-line and absent from the switchyard.

Impacts to Big Game (Wind Park)

Due to the lack of data regarding impacts of wind energy development on big game, it is difficult to predict the effects of the proposed project components on antelope, mule deer, and elk populations, though based on information received from AGFD the following is anticipated: 1) potential displacement would be moderate for wintering individuals utilizing Sub-study Area A; 2) impacts during parturition would be low for the wind park study area as a whole; and 3) avoidance of portions of Sub-study Area A, and to a lesser extent Sub-study Area B, by migrating pronghorn would be possible. However, this effects analysis is based on telemetry data from individuals collared outside the wind park study area and it is possible that individuals trapped and collared within the wind park study area may exhibit different spatial use patterns.

Impacts to Big Game (Transmission Tie-line and Switchyard)

The proposed transmission tie-line may have indirect impacts on elk by providing public access into previously unused areas, although impacts would not affect overall elk habitat in the Forest or population trends for the species. The transmission tie-line and switchyard would result in the loss of less than 10 acres of ponderosa pine forest, representing less than 0.01 percent of estimated ponderosa pine forest habitat within the Forest. Age class composition of ponderosa pine in the area is not specifically understood at this time; however, observations during the site visit indicate only individual trees classed as early seral ponderosa pine may be present within the area identified as ponderosa pine forest. The loss of individual early seral ponderosa pine within the small area of ponderosa pine forest impact from the transmission tie-line would not affect elk habitat, habitat use, or population trends within the Forest. The species preferred summer habitat (mixed-conifer and spruce-fir forests) are absent from the area immediately adjacent to the transmission tie-line and switchyard; however, pinyon-juniper woodlands in the area likely support wintering elk. While the proposed transmission tie-line and switchyard would permanently remove up to 25 acres of pinyon-juniper woodland, there are roughly 630,000 acres of pinyon-juniper woodland within the Forest. This habitat type is abundant in the region and not a unique habitat feature. Construction activities may cause short-term disturbance on elk behavior or movement in the local area. Operation of the transmission tie-line and switchyard is not anticipated to have long-term impacts on elk behavior or movement patterns. Population trends and habitat viability associated with this species would not be impacted by construction and operation of the transmission tie-line and switchyard.

The proposed transmission tie-line and switchyard also may have indirect impacts on mule deer; however, impacts would not affect overall deer habitat within the Forest or population trends for the species. Aspen forests are absent from the area and, while the proposed transmission tie-line and switchyard would permanently remove up to 25 acres of pinyon-juniper woodland, there are roughly 630,000 acres of pinyon-juniper woodland on the Forest. This habitat type is abundant in the region and not a unique

habitat feature. Population trends and habitat viability associated with this species would not be impacted by construction and operation of the transmission tie-line and switchyard.

The proposed transmission tie-line and switchyard may have indirect impacts on antelope; however, impacts would not affect overall habitat in the Forest or population trends for the species. Open grassland, the species preferred habitat, is the dominant habitat type comprising the transmission tie-line and switchyard. Construction activities may result in short-term impacts to grassland habitats preferred by the species, however, grassland occurs over 151,000 acres within Management Area 10, which includes Anderson Mesa, as required by Forest BMPs. Temporary construction impacts to grassland would be mitigated through vegetation restoration. Construction may also result in short-term changes in pronghorn movement or behavior if pronghorn occur in the project area during construction. Operation of the transmission tie-line and switchyard would not be expected to have an effect on pronghorn populations. Given the small acreage of grassland habitat impacted by the proposed transmission tie-line and switchyard, and the fact that this habitat type is abundant throughout the region, the Anderson Mesa pronghorn population trends and habitat viability would not be impacted by construction and operation of the transmission tie-line and switchyard.

3.2.2.3 Alternative Transmission Tie-line Corridor

Impacts described above would be similar to the impacts that would result from the implementation of Foresight's proposed transmission tie-line alignment. The location of the alternative alignment is within one-half mile of the proposed alignment, and similar biological conditions exist along this alignment.

3.2.2.4 No Action Alternative

Biological resources would not be disturbed or otherwise affected if the wind park, transmission tie-line, and switchyard were not constructed. As a result, no impacts to biological resources would be expected.

3.3 CULTURAL RESOURCES

This section provides contextual background information on cultural resources in proximity to the wind park study area, transmission tie-line, and Western's switchyard including the area's prehistoric, ethnographic, and historical settings. This section also summarizes the results of previous cultural surveys in the vicinity and analyzes the proposed project's potential impacts on cultural resources. Cultural resources include archaeological sites, historic structures and features, as well as Traditional Cultural Properties (TCPs) that are important to a community's practices and beliefs and that are necessary to maintain a community's cultural identity.

Information on cultural resources was derived from a number of sources. A Class I (literature search) report (Duncan et al. 2010) was prepared for Western. For this report record searches were conducted at the Arizona State Museum, Arizona SHPO, and Forest Service. In addition, historic maps and documents were researched at the BLM, including General Land Office maps and homestead and mining patents. Consultation was also carried out with experts knowledgeable in the cultural resources of the area. Class III Intensive pedestrian surveys were conducted in May, July, and October 2010 and March 2011 of the switchyard, transmission tie-line, tie-line access road, and the wind park site access road.

Pedestrian survey in May 2010 consisted of two Transcon Environmental, Inc. (Transcon) archaeologists and two Zuni Heritage and Historic Preservation Office (ZHHPO) archaeologists walking 15-meter transects providing 100 percent coverage of the interconnection switchyard footprint, a 200-foot area of potential effect (APE) outward in all directions of the perimeter, as well as a 100-foot-wide APE of the switchyard access road and a 300-foot-wide APE of the new 345-kV transmission tie-line. In July 2010, a second field visit by one Transcon and one ZHHPO archaeologist occurred to record cultural resources

that were identified during the May 2010 surveys. One Transcon archaeologist returned in October 2010 with an archaeologist specializing in the prehistoric ceramic types of the region to further record identified cultural resources. In March of 2011, one Transcon archaeologist, one Western archaeologist, and two archaeologists from the Hopi Cultural Preservation Office conducted a pedestrian survey consisting of 15-meter transects covering 100 percent of a 150–200 feet APE centered on the access road alignment beginning at Meteor Crater Road, across Diablo and Yeager Canyons, and ending at the boundary of the wind park study area.

3.3.1 Affected Environment

3.3.1.1 Resource Evaluation Area

The cultural resources evaluation area is based on information derived from the executed Programmatic Agreement (PA) for the project and includes the wind park study area, the proposed site access road, transmission tie-line, and switchyard and an area one mile around the perimeter of the switchyard and on each side of linear portions (the transmission tie-line and site access road) and within three miles of the wind park study area to account for indirect visual effects.

3.3.1.2 Characterization

Regulatory Background

Federal agency responsibilities with regard to cultural resources are addressed by a number of laws, implementing regulations, EOs, PAs, and other requirements. These include the NHPA of 1966, Native American Graves and Repatriation Act (NAGPRA), American Indian Religious Freedom Act (AIRFA), Executive Order (EO) 13007 "Native American Religious Practices," and EO 13175 "Consultation and Coordination With Indian Tribal Governments."

The principal Federal law addressing cultural resources is the NHPA, as amended (16 USC 470), with its implementing regulations (36 CFR Part 800). NHPA describes the process for identifying and evaluating historic properties; assessing the effects of Federal actions on historic properties; and consulting to avoid, reduce, or minimize adverse effects. The term "historic properties" refers to cultural resources that meet specific criteria for eligibility for listing on the NRHP. Section 106 of the NHPA requires that Federal agency decisions affecting these places consider cultural and historic values and the options available to protect these properties. Section 106 also requires consultation with Indian tribes whose traditional lands could be affected by "undertakings." EO 13175 delineates the Government-to-Government Relationship between Native American Tribal Governments and Federal agencies through which these consultations must occur. NAGPRA was enacted in 1990 to protect Native American burials, associated funerary objects, and objects of cultural patrimony encountered on Federal land. The AIRFA and EO 13007 both pertain to Native American sacred sites. EO 13007 states that Federal agencies must "to the extent practicable and not clearly inconsistent with essential agency functions, accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and avoid adversely affecting the physical integrity of such sacred sites."

Western, as the lead Federal agency, is responsible for identifying, evaluating, and assessing effects of construction and operation of the proposed project on cultural resources in concurrence with SHPO, land managing agencies, and other consulting parties. These responsibilities have been outlined in a PA that has been executed by Western, the Forest, the SHPO, and the Advisory Council on Historic Preservation (ACHP), and other concurring parties, including Foresight, the Arizona State Museum, and Tribes. As is common practice, this Final EIS does not present the exact locations of cultural resources (including historical sites, prehistoric archaeological sites, and TCPs) in an effort to help preserve those sites from vandalism.

Cultural History

Prehistoric Period (11,500 B.C.–A.D. 1500)

The earliest evidence of human occupation in Arizona dates to the Paleoindian Period roughly 11,500 years ago. Paleoindian groups were known for mobile, hunting-based lifestyles with an emphasis on the exploitation of megafauna. The Clovis complex, the earliest undisputed culture during this time period, is strongly evident in southeastern Arizona (Danson 1961; Huckell 1982; Downum 1993). However, Geib and Pilles have compiled evidence of the occupation of Paleoindian groups in northern Arizona and have documented the discovery of Clovis points near the project area, specifically Anderson Mesa, Anderson Canyon, and Dog Valley (Geib and Pilles 2000).

Major environmental changes and the extinction of megafauna marked the beginning of the Archaic Period (7500 B.C.–A.D. 500) and prompted a shift in subsistence strategies. Archaic groups are characterized by their use of diverse plant resources and their adaptation to hunting smaller game. Within the Flagstaff region, knowledge of this period is derived from scattered Archaic-style points and a limited number of archaeological sites (Windmiller and Huckell 1973; Bremer 1989; Anderson 1990; Keller and Dosh 1996). Archaic period points and possible Late Archaic sites have been located in the area surrounding the project (Wilson 1969; Batcho 1982).

The Formative Period is characterized by the emergence of a ceramic tradition. The associated cultural group within the Formative Period, termed the Sinagua by Colton, occupied the Flagstaff area from roughly A.D. 600 to 1400 (Colton 1939; Reid and Whittlesey 1997). Regionally, the Sinagua are situated amidst the major cultural units of the Southwest—the Mogollon, Anasazi, Patayan and Hohokam. Two distinct Sinagua populations distinguish themselves within the archaeological record due to their regionally diverse material cultures and adaptations to different environmental zones. These groups are known as the Northern Sinagua, located in and around Flagstaff (including the project study area), and the Southern Sinagua, situated in Verde Valley (Colton 1946).

From their pottery, early pithouse styles, and later rectangular ceremonial structures (kivas), the Sinagua seem to be a regional variation of the Mogollon cultural tradition and are recognized by their locally manufactured brownwares and a general lack of decorated pottery. Being located at the interface between several cultural groups, non-local material culture attributes, such as Hohokam-like pithouses and ballcourts, are occasionally found (Fish et al. 1980; Cordell 1984). Whether these shared cultural traits indicate population movement between groups, extensive trade networking, or some combination of both, is still debated.

The Hopi claim ancestry to the Sinagua and other Ancestral Puebloan groups. The Zuni claim ancestry to all Ancestral Puebloan groups, including the Sinagua. Archaeological sites in and around the project study area could show evidence of Ancestral Puebloan cultures and thus, could be of interest to the Zuni and the Hopi people. The Zuni recognize the project study area and the areas surrounding it to have important cultural and religious meaning. Archaeological sites, trails, petroglyphs, and shrines that are located within or near the project study area are viewed as a physical record that this area is a part of the Zuni cultural landscape and figured prominently in Zuni history. Chavez Pass, which is located immediately to the south of the wind park study area, is an area of interest to both the Hopi and Zuni people. Canyon Diablo, which runs southwest/northeast within the wind park study area, and Meteor Crater to the northeast, are both important religious areas for the Zuni. The San Francisco Peaks, visible from the wind park, are important to the Zuni for medicinal plant, minerals, and pinyon nut collecting activities. Thus, the ZHHPO states that the project study area and surrounding area play a "significant role in the continuation of the cultural identity of the Zuni people" (ZHHPO 2010).

Hopi traditions recognize Chavez Pass as an ancestral gateway on a prehistoric route located south of the project study area (Pilles 1987). This trail, part of an extensive prehistoric trade route from New Mexico through north-central Arizona, was used for more than 1,200 years and has been named the "Palatkwapi Trail" by historian James Byrkit (Byrkit 1988a). Zuni traditions also recognize Chavez Pass as a sacred place where the A:Shiwi separated during their migrations. Zuni cultural advisors identified shrines and petroglyphs at Chavez Pass during a field visit in April 2010 that supports this traditional oral history (ZHHPO 2010). Canyon Diablo contains important Zuni ancestral migration sites for the Zuni and both Canyon Diablo and Meteor Crater have names in the Zuni language (ZHHPO 2010).

> *The Zuni believe that these places are still spiritually inhabited by their ancestors and that their preservation is vital to maintaining a harmonious balance with nature and the spiritual world. The Zuni believe that physical disturbances to these sacred places can cause an imbalance in the natural and spiritual worlds* (ZHHPO 2010).

Sinagua chronology is related to a major eruption that occurred in the Flagstaff area resulting in the creation of Sunset Crater (McGregor 1936; Colton 1960; Pilles 1979). Some researchers postulate that the eruptions lasted as late as 1250 AD, but most accept a late 11th century date. The Sinagua chronology is divided in terms of pre-eruptive and post-eruptive phases initially established by Colton and still in use today (Colton 1946; Pilles 1988).

The three pre-eruptive phases are known as Cinder Park (A.D. 600 to 700), Sunset (A.D. 700 to 900), and Rio de Flag (A.D. 900 to roughly 1066) (Pilles 1988). According to Pilles, the ceramics, architectural styles, settlement plans, and subsistence strategies were fairly uniform throughout these phases (1979). During this time the Sinagua were characterized as "hunter-gathers and farmers living in small to medium-sized pit house villages" (Kamp and Whittaker 1999). Sites dating to these phases have been discovered in and around the project study area (Wilson 1969; Henderson 1979; Batcho 1982).

Post-eruptive phases began with the Angell-Winona (A.D. 1064 to 1100) and Padre (A.D. 1100 to 1150) phases (Kamp and Whittaker 1999). During this phase there existed a variety of pithouse forms, but the classic Angell house with an entry/alcove to the east is most common. Populations settled at lower elevations among the pinyon-juniper zones as opposed to settlement locations in the higher ponderosa zone, preferred in previous phases. Masonry architecture is common during the subsequent Padre phase, including rectangular masonry-lined pit houses, field houses, above-ground structures, and community rooms (Pilles 1996).

The Elden phase (A.D. 1150 to 1250) marked a peak in Sinagua culture characterized by the construction of large pueblos, extensive agricultural systems, and numerous field houses (Pilles 1978; Reid and Whittlesey 1997). Agricultural features during this phase included terraces, check dams, reservoirs, linear border, and grid border systems (Kamp and Whittaker 1999). Population was concentrated in locations north and east of Flagstaff and in the Anderson Mesa area to the south. "Forts" were built atop hills and high cinder cones during this time, but their primary function is still unknown (Pilles 1987).

The final two phases, Turkey Hill (A.D. 1250–1300) and Clear Creek (A.D. 1300–1400), were periods of decline and abandonment (Reid and Whittlesey 1997). According to researchers, hardships were likely due to unfavorable environmental conditions (McGregor 1965; Downum 1988, 1992). The Turkey Hill phase is noted for the reduction or abandonment of settlement units and agricultural systems.

After A.D. 1425, complete abandonment of the large pueblo towns occurred, and the Sinagua culture disappeared as a distinct entity from the cultural landscape. Archaeological evidence as well as Hopi oral traditions indicates that the remaining Sinagua moved to the Homol'ovi sites and then later to the Hopi

Mesas, where their descendants still live today (Pilles 1987; Reid and Whittlesey 1997). Hopi and Zuni traditions suggest some of the Anderson Mesa Sinagua moved to the Zuni area as well.

Historic Period (A.D. 1540–1930)

Spanish exploration of the region reportedly began when Coronado's men visited the Hopi Mesas and the Grand Canyon in the 1540s (Cline 1976). Later, members of the Antonio de Espejo expedition traveled through Chavez Pass in 1583. Historians speculate that Espejo's route followed the prehistoric Palatkwapi Trail through Sunset and Chavez Passes and south into the Verde Valley (Bartlett 1942; Hammond and Rey 1966; Byrkit 1988a). In 1598 Spanish explorer Marcos Farfan de los Godos, under the leadership of Juan de Onate, reportedly traveled along the same trail in search of silver mines (Cline 1976). By 1604, Onate and the Farfan party returned to New Mexico via the same route (Stein 1994). Franciscan missionaries established a series of missions on the Hopi Mesas in 1629, but were driven out a few decades later (Cline 1976). Through the rest of the 17th century, no renewed Spanish exploration or missions occurred in the region (Wilson 1969).

In the project vicinity two trails, the Thirty-Fifth Parallel and the Palatkwapi Trail, were used extensively by sheep herders prior to the American Period. The Thirty-Fifth Parallel trail was part of the famous sheep herding route from New Mexico to California (Cline 1976; Neff 1984). This trail, used mainly by Spanish and Basque herders, was located north of the project study area. The Palatkwapi Trail, previously mentioned as a prehistoric trade route, served as a sheep herding trail for Anglo, Spanish, and Basque herders before and into the American Period (Byrkit 1988a).

Interest in the Flagstaff and Winslow areas was rekindled after the Treaty of Guadalupe Hidalgo was signed in 1848 to end the war with Mexico (Byrkit 1988a). As a result, the first American expeditions to the region are documented with journeys by Captain Lorenzo Sitgreaves in 1851 and Lieutenant Edwards F. Beale in 1857 (Cline 1976). Stories of Navajo groups hiding in Canyon Diablo to escape and combat Anglo travelers were validated with the location of a few sites within the canyon, but outside of the project study area (Wilson 1969). European discovery of a giant crater formed by meteor impact, a major landmark later known as Meteor Crater, drew scientists to the area at the end of the 19th century.

Chavez Pass was named for Colonel J.F. Chavez who escorted the territorial government party from Santa Fe to Fort Whipple in 1863 (Neff 1984). Chavez's routes were associated with a military and stage coach road, and he traversed the project study area on several other occasions during 1864 (Byrkit 1988a; Byrkit 1988b). According to these sources, Chavez never passed directly through the pass that now carries his name.

Sheep and cattle herding along with lumber became major industries in and around Flagstaff in the late 1800s. A populous Basque community resided in Flagstaff due to their role in the local sheep industry (Stein 1991). During this period a major sheep operation owned by Anglo sheep herders, the Daggs brothers, was headquartered near Chavez Pass (Neff 1984). Wild horses were rounded up for military use during World War I in the Anderson Mesa area and a few remnants of the corrals still exist.

The Star Line Transportation Company established a stage coach route from Prescott to Santa Fe with Chavez Pass as a stop (Byrkit 1988a). However, the establishment of the Atlantic and Pacific Railroad through Flagstaff in 1882 resulted in fewer travelers utilizing the older route through Chavez Pass (Byrkit 1988a). The railroad, situated along the Thirty-Fifth Parallel, led to the growth and development of towns along the line, such as Flagstaff and Winslow.

The Forest was established in July 1908 and serves as the western edge of the wind park study area. Homesteads and livestock operations occurred in and around the project study area due to favorable laws

such as the Homestead Act of 1862 and the Stock-Raising Homestead Act of 1916 (Neff 1984). Eleven homesteads were established within the project study area during the 1920s and 1930s, although the Christian Jurgenson homestead dates to 1898. Fourteen stock raising homesteads were established between 1922 and 1936. In addition, a mineral lands patent was obtained to quarry the rock at Meteor Crater. By the 1930s, the project study area was mainly used by the Bar T Bar Ranch Corporation for the Winter ranging of cattle (Neff 1984).

Previous Sites and Surveys

Records were checked at the Arizona State Museum, Arizona SHPO, the Forest, and the AZSITE on-line cultural resources database. Searches were conducted to determine whether previously identified cultural resources were present or if previously reported archaeological investigations had been conducted within the evaluation area.

Background research identified 69 previously conducted surveys within the resource evaluation area; 23 of these surveys overlap or occur within 100 feet of the wind park study area, transmission tie-line, and/or switchyard.

The Class I Cultural Resources Overview prepared for the project identified 678 previously recorded cultural resources within the cultural resources evaluation area, of which 24 sites potentially overlap or occur within 100 feet of the wind park study area, transmission tie-line, and/or switchyard. Previously identified sites consist of both prehistoric and historic manifestations. In general, the research indicates a relatively low density of sites within the wind park study area and the two primary access routes originating from Meteor Crater Road. The Class I Cultural Resources Overview indicates that the 345-kV transmission tie-line could extend through areas of higher site density that could include large prehistoric habitation sites and historic structures. Low site density is found in the vicinity of Western's proposed switchyard.

TCPs could be present within the cultural resources evaluation area. Western has initiated consultation with the Hopi and Zuni Tribes and the Navajo Nation, and consultations are ongoing. These consultations are being conducted to evaluate TCPs and support Western's and the Forest Service's government-to-government consultations with the tribal governments and appointed tribal staff. Tribal cultural staff members have been invited to participate in cultural resource surveys and to conduct ethnographic and TCP studies. In April 2010, representatives from the Zuni tribe accompanied by Western archaeologists and one archaeologist from Transcon were flown by helicopter over the project area and were taken by foot to requested locations of interest adjacent to the project area. As a result of this field visit, the ZHPPO produced a report titled *Zuni Traditional Cultural Property Assessment and Cultural Issues Associated with the Proposed Wind Project, Coconino County, Arizona* and submitted the report to Western in June 2010. Two members of the ZHPPO subsequently participated in a pedestrian survey of the proposed switchyard and transmission tie-line proposed on Forest-managed lands. Two representatives from the Hopi Tribe later participated in pedestrian survey of the proposed wind-park access road and were accompanied by a Western archaeologist and Transcon archaeologist to areas of tribal interest adjacent to the project area. Consultations would continue into the construction stages of the proposed project.

The Class III Intensive Pedestrian Survey conducted in May, July, and October 2010 of the proposed switchyard and transmission tie-line and March 2011 for the proposed access road identified 12 previously unrecorded archaeological sites and seven rock cairns that are of interest to the Hopi. Western would consult with the signatories to the PA to determine site eligibility to the National Register. Class III Intensive Pedestrian Surveys would be completed for the wind park study area before construction begins and the results of all surveys would be provided in a Class III Cultural Resources report. All

consulting parties including the SHPO, Tribes, and the Forest Service would receive the Class III Cultural Resources report for review and comment prior to construction. Table 3.3-1 summarizes the newly recorded archaeological sites known at the time of the writing of this EIS.

TABLE 3.3-1
NEWLY RECORDED ARCHAEOLOGICAL SITES

Site Number	Site Type	Cultural Affiliation	Location
FS-05-654	petroglyph	Sinagua	transmission tie-line
FS-05-655	petroglyph	Sinagua	transmission tie-line
FS-05-656	temporary habitation site (ceramic / lithic scatter)	Sinagua	transmission tie-line
FS-05-657	temporary habitation site (ceramic / lithic scatter)	Sinagua	transmission tie-line
FS-05-658	temporary habitation site (ceramic / lithic scatter)	Sinagua	transmission tie-line
FS-05-659	agricultural site	Sinagua	transmission tie-line
FS-05-660	temporary habitation site (ceramic / lithic scatter)	Sinagua	transmission tie-line
FS-05-661	temporary habitation site (ceramic / lithic scatter)	Sinagua	transmission tie-line
FS-05-662	temporary habitation site (ceramic / lithic scatter)	Sinagua	transmission tie-line
Field Site 1	Historic artifact scatter and coral associated with ranching and prehistoric artifact scatter	Historic / Prehistoric	access road
Field Site 2	historic stone structure remains	Historic	access road
Field Site 3	prehistoric lithic scatter	Prehistoric	access road
Rock Cairns 1–7	rock cairns scattered between Diablo Canyon and Chavez Pass	Unknown	access road

3.3.2 Environmental Consequences

3.3.2.1 Standards of Significance

Of the 24 previously recorded sites potentially overlapping or occurring within 100 feet of the wind park study area, transmission tie-line, and/or switchyard, four are eligible for listing on the NRHP. To define the criteria for impact evaluation, thresholds of significance for a given environmental effect are provided for cultural resources. Significance of any cultural resources is determined following the criteria for eligibility for nomination to the NRHP, as defined in 36 CFR Part 60.4. The NRHP criteria states:

> *The quality of significance in American history, architecture, archeology, and culture is present in districts, sites, building(s), structures, and objects of State and local importance that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and*
>
> *a) That are associated with events that have made a significant contribution to the broad patterns of our history; or*
> *b) That are associated with the lives of persons significant in our past; or*
> *c) That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess*

high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

d) That have yielded, or may be likely to yield, information important to history or prehistory.

If resources are determined to be eligible for listing on the NRHP, and SHPO concurs with Western's determination, these resources are then considered significant and the agency must avoid or lessen the impacts to them. If it is not possible to avoid one or more of these eligible sites, a treatment plan would be developed through consultation with Indian Tribes, land managing agencies, State and local agencies, public, and the ACHP to mitigate project-related effects.

A significant impact on cultural resources could result if any of the following were to occur from construction or operation of the proposed project components:

- Damage to, or loss of a site of archaeological, Tribal or historical value that is listed, or eligible for listing, on the NRHP.
- Loss or degradation of a traditional cultural property or sacred site, or if the property or site is made inaccessible for future use.
- Disturb human remains, including those interred outside of formal cemeteries.

3.3.2.2 Foresight's Proposed Project and Proposed Federal Actions

Research identified 678 previously recorded cultural resources within the cultural resources evaluation area for the proposed project facilities. Twenty-four of the sites potentially occur within 100 feet of the wind park study area, transmission tie-line, and/or switchyard. Of the 24 sites, 4 of these are recommended as eligible for listing on the NRHP. The preliminary layout plan was prepared to avoid impact to these sites. Western would consult with the signatories to the PA to determine the National Register site eligibility for 12 newly recorded sites and seven rock cairns based on the Class III pedestrian surveys completed for the proposed switchyard, transmission tie-line, and wind park access road, and newly recorded sites for the other project components. Western and the Forest Service's goal is to achieve a no adverse effect by avoiding National Register-eligible cultural resources to the extent feasible and practical. Provisions of the PA provided in Section 2.7 (Foresight and Agency Resource Protection Measures) state that a reasonable effort would be made to design the project in such a manner as to minimize impacts to NRHP listed and eligible properties. This could include siting project facilities to avoid specific cultural resource sites.

The development of wind park and transmission tie-line facilities could also indirectly impact areas of interest to Native Americans, such as sacred areas, or areas used for collecting traditional resources, such as birds and medicinal plants. Visual impacts on significant cultural resources, such as sacred landscapes, historic trails, and viewsheds from other types of historic properties (e.g., homes and bridges) could also occur. In addition, there could be visual impacts on TCPs because the visible wind turbines could be perceived as an intrusion on a sacred or historic landscape that could result in a significant adverse effect to these TCPs. TCPs are currently being evaluated through tribal consultation.

As previously described, a PA has been executed by Western, the Forest, Arizona SHPO, and the ACHP. Foresight has signed the PA as a concurring party. The PA, prepared by Western and reviewed by consulting parties, establishes the area of potential effect for the proposed project, describes survey methodology, proposes a treatment plan for identified resources that cannot be avoided and describes procedures for unanticipated discoveries.

Foresight would avoid, to the extent possible, areas containing identified resources. Further, the PA would address options for the treatment of historic properties, and specific mitigation measures would reduce impacts to sensitive resources so that there would be no adverse effect on cultural sites. Class III surveys on all proposed disturbance areas would be conducted prior to land disturbance for construction.

3.3.2.3 Alternative Transmission Tie-line Corridor

Construction and operation of the alternative transmission tie-line would not result in substantial difference to the impacts of cultural resources in the area. The location of the alternative alignment is within one-half mile of the proposed alignment and would have a similar cultural resources density.

3.3.2.4 No Action Alternative

Cultural resources would not be encountered or otherwise affected if the wind park, transmission tie-line, and switchyard were not constructed. As a result, no impacts to cultural resources would occur.

3.4 GEOLOGY AND SOILS

3.4.1 Affected Environment

3.4.1.1 Resource Evaluation Area

The geology and soils evaluation area for this analysis is the footprint of the wind park study area, transmission tie-line, and Western's switchyard. Maps, data, and publications about local soils and geological resources were gathered from websites maintained by NRCS, U.S. Geological Survey (USGS), and the Forest Terrestrial Ecosystem Survey. This information was used for supporting geology and soils analysis, and project planning and implementation.

3.4.1.2 Characterization

Geomorphology and Geology

The geology and soils evaluation area is situated just above the Mogollon Rim at the southern boundary of the Colorado Plateau. It is located between Anderson Mesa and the Little Colorado River in a section of the Colorado Plateau known locally as the Mogollon Plateau. Basement rock is Kaibab limestone and, below that, Coconino sandstone that formed in the Permian period at the end of the Paleozoic era. Both limestone and sandstone are sedimentary rock laid down 286 to 245 million years ago (USGS 1997). Late in the Permian, the region was uplifted above a sea and eroded into a plain incised by shallow stream channels (Cronic 1983). The Plateau was uplifted again about five million years ago, this time tipping toward the north and establishing present-day stream channels (Foos 1999).

About 50,000 years ago, an iron mass plunged into the earth creating Meteor Crater, located approximately five miles southeast of the intersection of I-40 and Meteor Crater Road. The meteorite crashed and exploded, creating a vast hole and rim in the Kaibab limestone bedrock. The impact threw fragments of the meteorite onto the area including Canyon Diablo (Chronic 1983).

Mineral Resources

The geology and soils evaluation area does not have deposits of oil, natural gas, or minerals that would be used in industrial or energy applications (Arizona Geological Survey 2009). Sand and gravel are common resources in the region.

Geologic Hazards

Four million years ago, volcanic activity was a hazard near present-day Flagstaff and Springerville. The most recent eruptions occurred over a 150 year period beginning in 1064, at Sunset Crater located approximately 35 miles northwest of the evaluation area. However, there is no evidence of frequent small earthquakes caused by the movement of molten rock or other activities that normally signal renewed activity (Fellows 2000). Fewer than ten shallow earthquake episodes have been recorded in the area south and east of Flagstaff since 1990. There is a 25 percent probability of a magnitude 5.0 or greater earthquake occurring in the next 50 years within 30 miles of the geology and soils evaluation area (USGS 2009). Figure 3.4-1 depicts the probability of an earthquake in the general vicinity of the evaluation area. There are several small fault zones within 25 miles of the evaluation area. The closest faults in Quaternary rock strata are the Rock House and Leupp faults, located north and west of I-40, and the Lake Mary and Mormon Lake fault zones located on Anderson Mesa.

Soils

The geology and soils evaluation area is almost 100,000 acres in size and has many soils formed from lithic bedrock. Mapped soil units are listed in Table 3.4-1 and their general locations are depicted on Figure 3.4-2 (wind park study area) and Figure 3.4-3 (transmission tie-line and switchyard).

Three soils, Deama, Epikom, Winona and their associated map units, account for 96 percent of the soils within the wind park study area. Deama and Winona soils are shallow and well-drained, formed from limestone and sandstone. Unweathered bedrock is often 19 to 23 inches beneath the surface with substantial stony, cobbly, and gravelly components in the subsoil layers. Epikom complex occurs on shallow to steep slopes. These soils have low potential to respond to frost or corrode concrete foundations. Most soils make poor natural road surfaces because of low strength, presence of a restrictive layer, and the potential for erosion and rutting.

Soils on lands managed by the Forest Service (depicted in Figure 3.4-3) within the proposed transmission tie-line and alternative transmission tie-line rights-of-way are mapped as part of the Forest Service's Terrestrial Ecosystem Survey. The vast majority of these soils are deep, well-drained, and weathered from basalt and related volcanic rocks (Hendricks 1985). Most of these soils are fine-textured (clayey), are moderately susceptible to erosion (moderate erosion hazard), and have severe limitations as a natural road base due to low strength and high shrink-swell hazard.

FIGURE 3.4-1

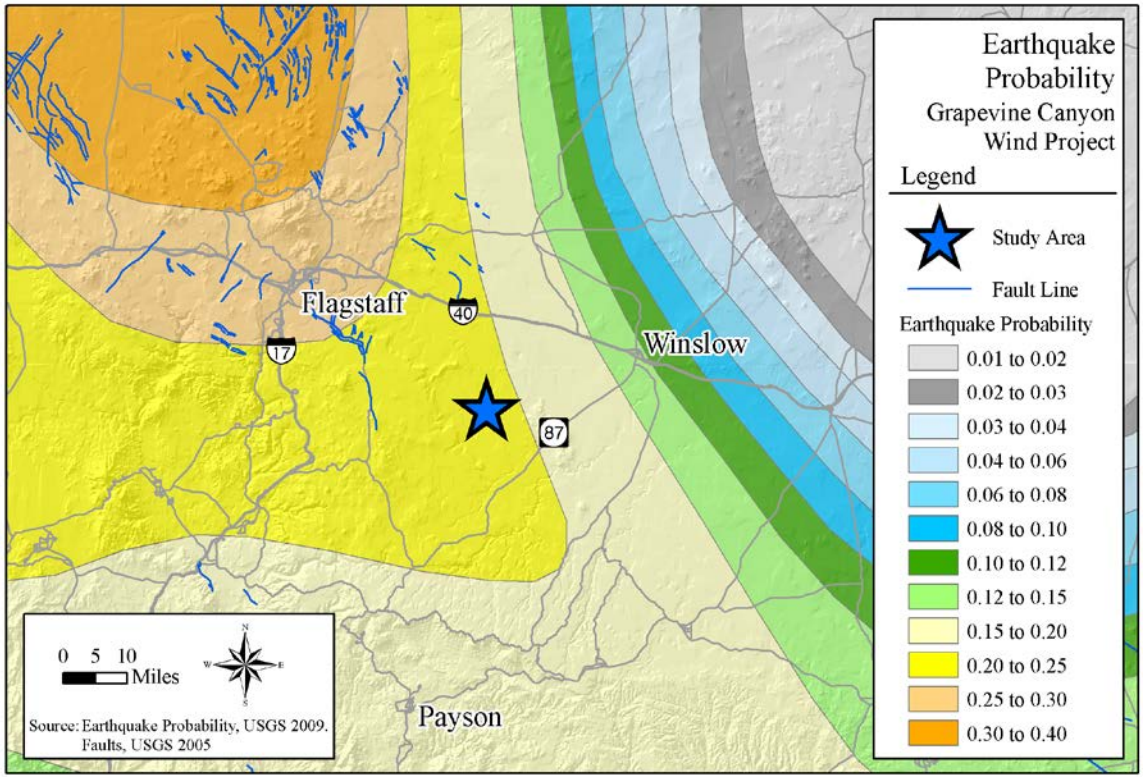


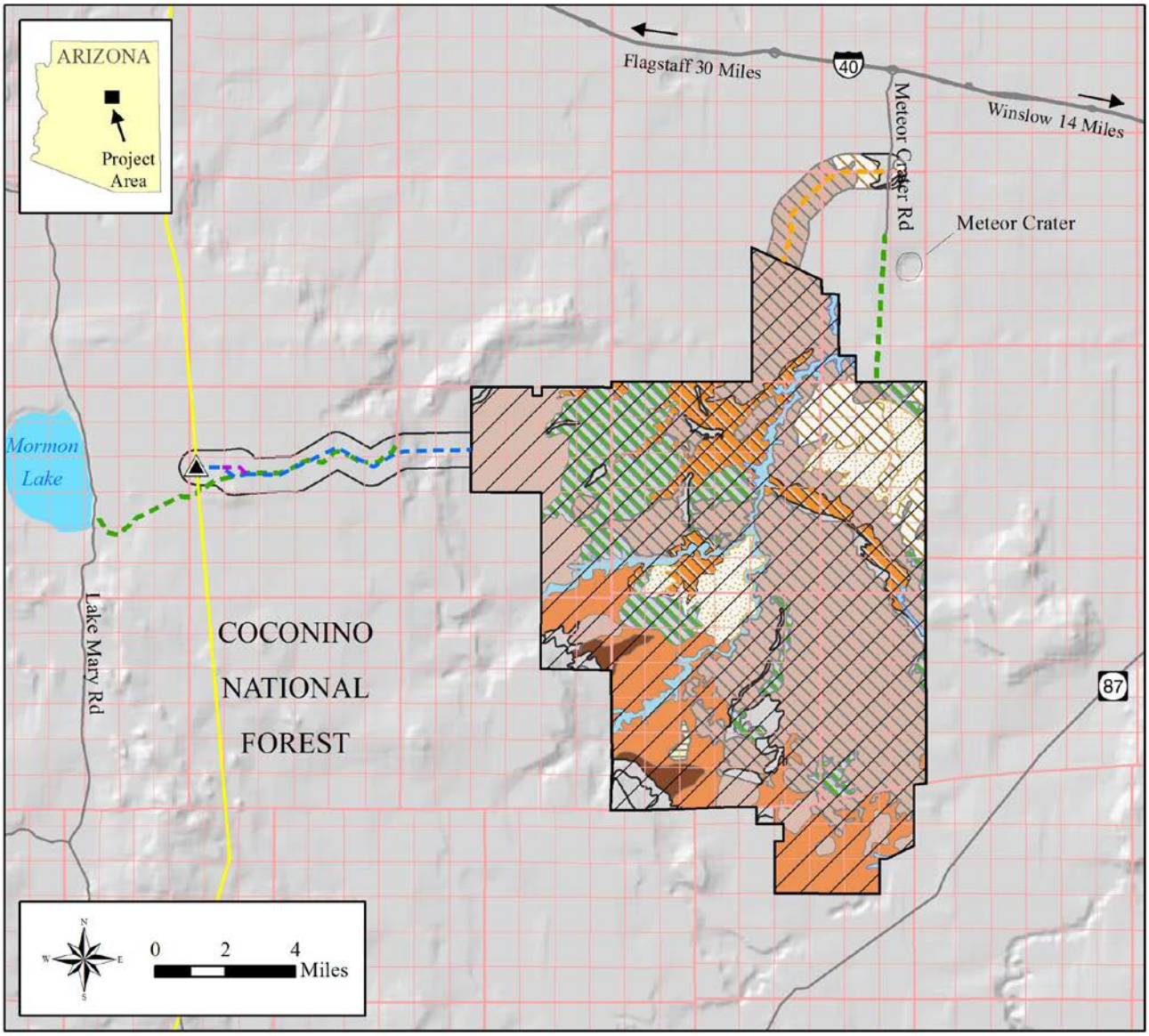
TABLE 3.4-1
MAPPED SOILS

Map Key	Soil Name	Area (acres)	Area %	Slope	Erosion Hazard		Corrosion Hazard Uncoated Steel	Limitations for Roads	Runoff Potential
					Water	Wind			
10	Deama gravelly loam	8,460	9%	2–15%	high	low	moderate	severe	high
11	Deama stony loam	13,032	14%	1–15%	high	low	moderate	severe	high
13	Deama-Toqui complex	1,440	2%	0–8%	high	low	moderate	severe	high
18	Epikom complex	3,974	4%	0–15%	high	low to moderate	high	severe	high
19	Epikom-Rock outcrop complex	—	<1%	8–60%	high	low	high	severe	high
29	Paymaster-Lynx association	871	<1%	gently sloping	low	low to moderate	moderate	moderate	moderately low
37	Rune silty clay loam	891	<1%	0–8%	low	low	high	low moderate	moderately high
38	Rune-Disterheff association	502	<1%	gently sloping	low	low	high	moderate	moderately high
39	Servilleta fine sandy loam	105	<1%	1–8%	moderate	moderate	high	moderate	moderately high

TABLE 3.4-1
MAPPED SOILS

Map Key	Soil Name	Area (acres)	Area %	Slope	Erosion Hazard		Corrosion Hazard Uncoated Steel	Limitations for Roads	Runoff Potential
					Water	Wind			
40	Servilleta-Tusayan complex	700	<1%	1–8%	moderately high	low to moderate	high	moderate	moderately high
44	Springerville very stony clay	235	<1%	0–8%	moderate	low	high	severe	high
48	Thunderbird-Rock outcrop complex	450	<1%	30–60%	moderately high	none	high	severe	high
49	Thunderbird-Springerville association	484	<1%	strongly sloping	moderately high	low	high	severe	high
55	Tusayan-Lynx association	232	<1%	gently sloping	low to moderately high	low	high	moderate	moderately low to moderately high
60	Winona gravelly loam	35,194	37%	0–8%	high	low	moderate	severe	high
61	Winona stony loam	11,881	13%	0–8%	high	low	moderate	severe	high
62	Winona-Boysag gravelly loams	218	<1%	0–8%	high	low	moderate	severe	high
64	Winona-Rock outcrop complex	7,022	7%	15–30%	high	low	moderate	severe	high
65	Winona-Rock outcrop complex	3,659	4%	30–70%	high	low	moderate	severe	high
66	Winona-Tusayan association	5,448	6%	gently sloping	high	low	moderately high	severe	high
436	Lithic and Calcic Ustochrepts-fine sandy loam	12	<1%	0–15%	moderate	moderate	—	moderate to severe	—
437	Lithic and Calcic Ustochrepts-fine sandy loam	24	<1%	0–15%	low to moderate	low to moderate	—	moderate to severe	—
439	Typic Haplustalfs-deep cobbly loam	15	<1%	15–40%	moderate	moderate	—	severe	—
453	Vertic and Typic Haplustalfs-deep cobbly clay loam	138	<1%	0–15%	moderate	moderate	—	moderate to severe	—
465	Typic and Vertic Haplustalfs-deep cobbly clay loam	20	<1%	0–15%	low to moderate	low to moderate	—	severe	—
523	Mollic Eutroboralfs-deep very cobbly clay loam	6	<1%	0–15%	low	low	—	severe	—
524	Typic Argiborolls and Mollic Eutroboralfs-moderately deep very stony and cobbly loam	7	<1%	15–40%	high	high	—	severe	—
	TOTAL	95,043	100 %						

Source: NRCS 2008, 2009b; Forest 2001



Legend

- Wind Park Study Area
- Alternative 345-kV Tie-line Alignment
- Proposed 345-kV Tie-line-Alignment
- Proposed New Site Access Road
- Existing Site Access Road
- Proposed Interconnection Switchyard
- Existing Western 345-kV Transmission Line

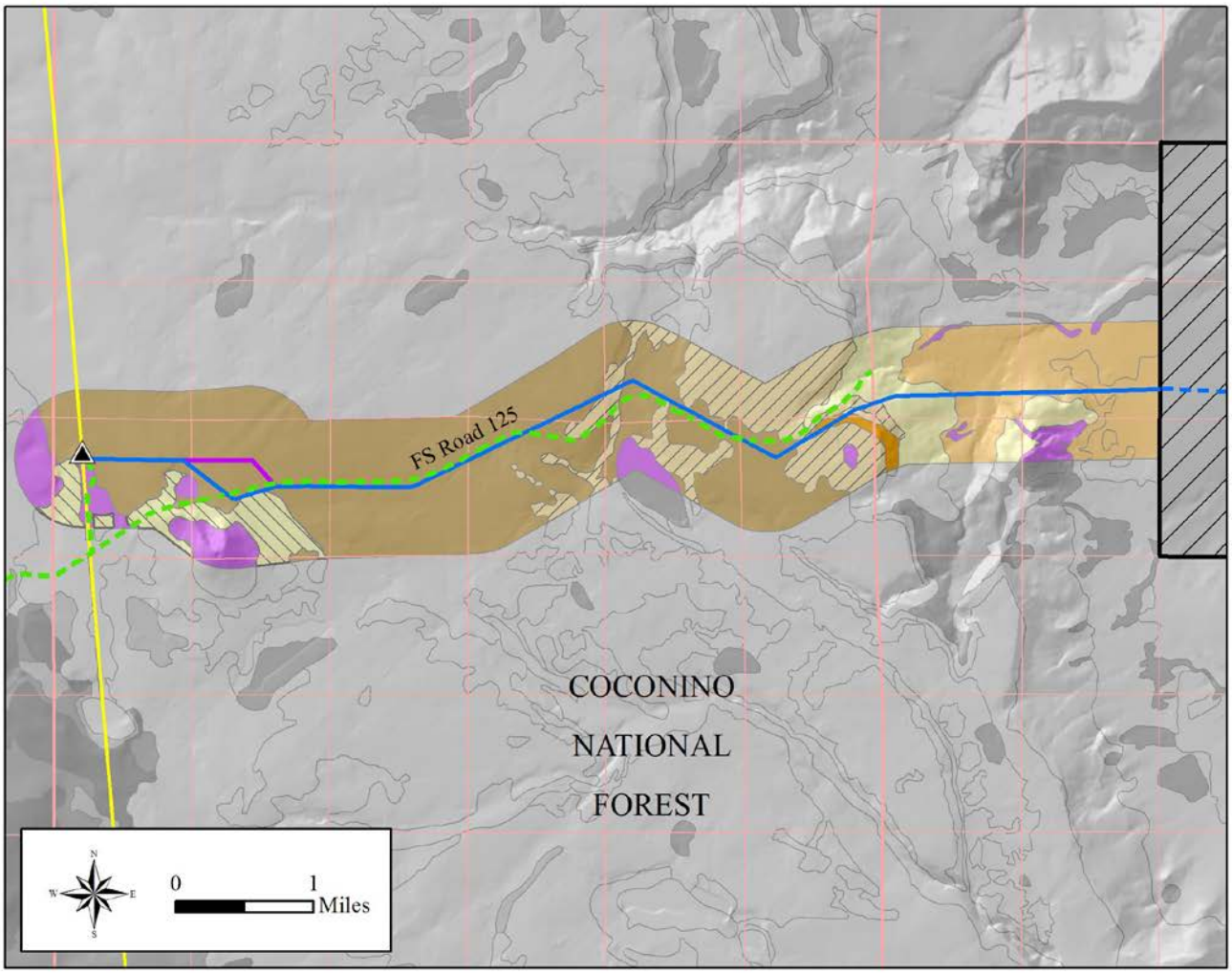
Soil Types that Comprise More than 90% of Evaluation Area

- 10 Deama gravelly loam, 2-15% slopes
- 11 Deama Stony loam, 1-15% slopes
- 13 Deama-Toqui complex, 0-8% slopes
- 18 Epikom complex, 0-15% slopes
- 60 Winona gravelly loam, 0-8% slopes
- 61 Winona stony loam, 0-8% slopes
- 62 Winona-Boysag gravelly loams, 0-8% slopes
- 64 Winona-Rock outcrop complex, 15-30% slopes
- 65 Winona-Rock outcrop complex, 30-70% slopes
- 66 Winona-Tusayan association, gently sloping
- Other

Source: USDA, NRCS, 2009b

Soils
Wind Park
Study Area
Grapevine Canyon
Wind Project

FIGURE 3.4-2



Legend

- Proposed Wind Park Study Area
- Proposed 345-kV Tie-line Alignment
- Proposed 345-kV Tie-line Alignment (Alignment to Be Determined)
- Alternative 345-kV Tie-line Alignment
- Proposed Interconnection Switchyard
- Existing Site Access Road
- Existing Western 345-kV Transmission Line
- 0436 & 0437 Lithic & Calcic Ustochrepts
- 0439 Typic Haplustalfs
- 0453 Vertic & Typic Haplustalfs
- 0465 Typic & Vertic Haplustalfs
- 0523 Mollic Eutroboralfs
- 0524 Typic Argiborolls & Mollic Eutroboralfs
- Other Soils Not Evaluated

Soils
Tie-line and Switchyard
Grapevine Canyon Wind Project

Source: USDA, Forest Service, Coconino National Forest, 2001

FIGURE 3.4-3

3.4.2 Environmental Consequences

This section evaluates the potential impact of the project on geological and soils resources. The primary concern is the potential for ground disturbance or erosion that would reduce the condition or the productivity of soils.

3.4.2.1 Standards of Significance

Impacts to geological and soils resources would be considered significant if any of the following conditions occur:

- Project development would cause appreciable, accelerated soil erosion and loss of productivity or slope failure.
- Soil disturbance, erosion, or compaction would cause long-term, negative impacts to rangeland or wildlife habitat.
- Mineral resources not available elsewhere would be altered or consumed.

3.4.2.2 Foresight's Proposed Project and Proposed Federal Actions

The proposed project would have no effect on prime farmland and/or agriculture or proposed land uses, because neither of these resources exists within the evaluation area.

Wind Park

The proposed wind park would necessarily disturb soil and bedrock resources to establish a primary access road, service roads, collection transmission system, step-up substations, construction staging areas, and WTG foundations. A total of approximately 2,050 to 2,193 acres would be temporarily disturbed leading to approximately 555 to 570 acres of permanently altered grades and soils of which approximately 450 acres would include new service roads (refer to Table 2.2-4).

Measures would be taken to confine vehicle traffic to existing roads per the RPMs outlined in Section 2.7. This would minimize potential soil compaction resulting from project-related travel on public and private roads to reduce the likelihood the proposed wind park would create adverse soil conditions, erosion, or slope failure that would degrade public land or roads. Significance thresholds for geology and soils would not be exceeded.

Over 90 percent of the wind park study area is covered with Deama and Winona soils that have a high potential for runoff and erosion from water once disturbed (refer to Table 3.4-1). Deama soils are gravelly, stony, shallow, loamy soils with 19 to 23 inches to bedrock. They are not susceptible to compaction but are low in rangeland productivity. However, there are several thousand acres of Winona-Tusayan soils (map key 66 in Figure 3.4-2) at the confluence of Grapevine Canyon and Canyon Diablo that are productive for rangeland forage and susceptible to compaction, runoff, and erosion from water. Winona loams (map key 60-62, and 66 in Figure 3.4-2) in general are shallow, productive, and have high potential for runoff and erosion from water. Soil disturbing activities, such as removing the soil protective cover or compacting the natural soil structure, could directly reduce rangeland forage. They also could potentially introduce a cycle of soil loss and introduction of aggressive non-native species that out compete and further reduce desirable forage species.

The proposed wind park would increase soil erosion and decrease soil productivity during the construction phase. The proposed wind park would permanently remove less than one percent of soil and geology resources in the geology and soils evaluation area from other land uses by converting them to access and service roads, crane pads, parking, and foundations. It could contribute to ongoing soil erosion if drainage structures and soil cover were not well maintained at foundation sites and along service roads.

In order to minimize soil erosion, compaction, loss of soil productivity, and the spread of noxious weeds, Foresight has proposed RPMs outlined under Geology and Soils in Table 2.7-1. With application of these measures, soil disturbance, erosion, or compaction would not cause long-term impacts to rangeland or wildlife habitat, and applicable significance thresholds for geology and soils would not be exceeded.

One or more borrow pit locations would be selected during final wind park design so that road base material and aggregate could be sourced and crushed on site. Disturbance for each borrow pit would be two to four acres. Sand and gravel are common resources and their use in the quantities required to complete construction of the proposed wind park and transmission tie-line would not substantially reduce their supply in the area; therefore, no unique mineral resources would be altered or consumed.

Transmission Tie-line

Table 2.2-6 provides estimates of the extent of ground disturbance along the transmission tie-line corridor including Federal, State trust, and private land. The total temporary disturbance is between 345 and 413 acres, with between 196 and 234 acres on Forest Service-managed lands. This estimate of construction disturbance on Forest Service-managed lands includes the construction staging area, transmission tie-line right-of-way, and access roads. Following construction, areas of permanent disturbance would remain at structure foundations and for access and spur roads to foundation pads where needed. Total permanent ground disturbance would be between 19 and 25 acres, with between 11 and 14 acres located on Forest Service-managed lands.

The proposed transmission tie-line right-of-way would require the use of approximately six miles of existing FS 125, FS 9483g, and new spur roads to access individual transmission structures (see Figure 2.2-14). FS 125 does not descend Anderson Mesa, so a new access road would be constructed within the proposed 200-foot right-of-way, adjacent to a drainage that is tributary to Yaeger Canyon. This portion of the transmission tie-line would follow an existing cattle trail west out of the wind park study area to minimize new land disturbance. This new access road would extend approximately 2.5 miles from FS 125 to the Forest Service boundary, then up to approximately 6.5 miles to the step-up substations. The total area of potential ground disturbance for road construction and maintenance would be between 18 and 24 acres with roughly between 10 and 13 acres on Forest Service-managed lands.

Most of the soils along the proposed transmission tie-line are loams that are moderately or highly erodible and have severe limitations for development as unsurfaced roads. On private and State trust lands, Deama and Winona loams have high runoff potential and high hazard for erosion from water (map keys 10, 61 in Figure 3.4-2). There is also a rock outcrop with 15–30 percent slopes located within the proposed right-of-way (map key 64 in Figure 3.4-2). On National Forest System lands, soils are primarily Ustochrepts (map keys 436, 437 in Figure 3.4-3) and Haplustalfs found in the tributary to Yaeger Canyon from Anderson Mesa (map keys 439, 465 in Figure 3.4-3). Both soil types have moderate hazard of erosion and severe limitations for road development. The Haplustalfs soils would compact, pond, and displace if disturbed while wet. Flowing water creates sheet and rill erosion when soil protective materials are removed. These soils resist revegetation due to their high clay content.

Construction of the transmission tie-line would increase soil erosion and reduce soil productivity for a relatively small area. The access roads and structure foundations would permanently remove between 19 and 25 acres of soil and geology resources from other land uses and could contribute to ongoing soil erosion if soil cover and drainage structures were not well maintained. To minimize impacts, RPMs identified in Table 2.7-1 under Geology and Soils would be implemented and impacts to geology and soils as a result of the proposed transmission tie-line would not cause appreciable, accelerated soil erosion and loss of productivity or slope failure nor cause long-term, negative impacts to rangeland or wildlife habitat. Applicable significance thresholds associated with soils would not be exceeded.

Western's Switchyard

A total of 24 acres would be temporarily disturbed by Western during construction of the proposed Switchyard. Switchyard construction would temporarily disturb approximately 20 acres of Forest Service-managed lands and an additional four acres would be temporarily disturbed during the installation of new tie-in dead-end structures on the Glen Canyon-Pinnacle Peak transmission lines leading into the new switchyard. Temporary use areas would be reclaimed prior to operations. The switchyard and staging area would be located on Haplustalf soils which are deep, cobbly clay loams formed on elevated plains (map key 453 in Figure 3.4-3). These soils have a moderate erosion hazard, and maintenance of vegetative groundcover is essential to prevent accelerated sheet and rill erosion and reduce seasonal surface cracking that accelerates drying of the subsoil. The success of revegetation is limited by soils with clayey textures at or near the surface. Haplustalf soils have severe limitations for unsurfaced roads because they are shallow and easily eroded.

The proposed switchyard would result in the permanent conversion of approximately 15 acres of Forest Service-managed lands with productive soils to industrial use. Construction activities would have an additional impact on Forest soils resources beyond those described for the transmission tie-line and access roads due to the nature of the site's soils. RPMs, as outlined in Section 2.7 for the proposed switchyard, would be applied to avoid spreading subsurface soils over, or mixing them with, surface soils. With the application of these RPMs, impacts to geology and soils as a result of the proposed switchyard would be minimized and significance criteria listed in Section 3.4.2.1 would not be exceeded.

3.4.2.3 Alternative Transmission Tie-line Corridor

The alternative transmission tie-line would permanently disturb between 20–26 acres, or one more acre than the proposed transmission tie-line, of which between 12–15 acres would be on Forest Service-managed lands. Although the length of the alternative transmission tie-line is approximately the same as the proposed transmission tie-line, the alternative transmission tie-line alignment requires approximately three-quarters mile more access roads to be constructed because it does not maximize the use of existing roadways. It would require establishing a new corridor within one-half mile of the proposed transmission tie-line which parallels FS 125 and FS 9483g. The alternative transmission tie-line alignment would be located on Haplustalf soils (map key 453 in Figure 3.4-3). These soils have a moderate erosion hazard. Maintaining vegetation, rock fragments, and other soil cover is essential in preventing accelerated erosion. These soils are problematic for revegetation activities due to clayey soils near the surface that shrink in response to dryness. Haplustalf soils are also problematic for developing unsurfaced access roads because they are shallow and erode easily. RPMs, as outlined in Section 2.7, would be applied and impacts to geology and soils would not cause appreciable, accelerated soil erosion and loss of productivity or slope failure nor cause long-term, negative impacts to rangeland or wildlife habitat. Applicable significance thresholds for geology and soils would not be exceeded.

3.4.2.4 No Action Alternative

Geology and soil resources would not be disturbed or otherwise affected under the No Action Alternative. Under this alternative, Western would not approve an interconnection for the Grapevine Canyon Wind Project and the Forest Service would not issue a permit for the transmission tie-line proposed for the wind park. The wind park, transmission tie-line, and switchyard would not be constructed and geology and soils would remain unchanged.

3.5 AIR QUALITY

3.5.1 Affected Environment

3.5.1.1 Resource Evaluation Area

This section addresses ambient regional air quality conditions and discusses potential air quality impacts related to the proposed wind park, transmission tie-line, and Western's switchyard and alternatives. Since there are no Class I airsheds or designated air quality nonattainment areas in the vicinity of the proposed facilities, the air quality evaluation area includes all of Coconino County.

3.5.1.2 Characterization

Climate and meteorological information was gathered from the Western Regional Climate Center (WRCC) and the National Oceanic and Atmospheric Administration (NOAA). Ambient air quality data were collected from the EPA Air Quality Database. Further rules and regulations were gathered from the Arizona Department of Environmental Quality (ADEQ). Meteorological conditions can affect the extent to which air pollutants are dispersed. Winds as reported at the Winslow, Arizona monitoring station are generally from the southwest and average approximately 6.7 miles per hour in December up to 11.7 miles per hour in April. An overview of these and other meteorological conditions is provided in Section 3.6 (Water Resources) of this EIS.

Air Quality Standards and Existing Air Quality

The Clean Air Act (CAA) of 1970, as amended in 1990, required the EPA to develop standards for pollutants considered harmful to public health or the environment. Two types of National Ambient Air Quality Standards (NAAQS) were established (EPA 2008c). Primary standards protect public health, while secondary standards protect public welfare, by including protection against decreased visibility and damage to things such as animals, crops, landscaping and vegetation, or buildings. NAAQS have been established for six "criteria" pollutants:

- Carbon monoxide (CO)
- Nitrogen oxide (NO_x)
- Sulfur dioxide (SO_2)
- Ozone (O_3)
- Particulate matter (PM_{10} and $PM_{2.5}$)
- Lead (Pb)

The CAA uses the Statewide Implementation Plan process, whereby plans are developed by individual States, approved by the EPA, and then implemented by the State. ADEQ is the State agency responsible for ensuring air quality regulation and has adopted the NAAQS for Arizona. Areas are classified as attainment, nonattainment, or unclassified. Attainment is achieved when monitored ambient air quality data is in compliance with the NAAQS for a specified pollutant. Non-compliance with a standard would result in nonattainment designation, and an unclassified designation indicates that insufficient data are available to determine compliance for that pollutant.

The nearest current nonattainment area is associated with the Phoenix metropolitan area located approximately 100 miles from the wind park study area, which is in nonattainment for O_3 and PM_{10}. The nearest air quality monitor to the wind park study area is located in Flagstaff, approximately 23 miles northwest of the western edge of the wind park study area. Monitors in Coconino County only collect information on $PM_{2.5}$, PM_{10}, and O_3, for which monitored levels are below NAAQS. Monitors for other criteria pollutants are not located in Coconino County.

The EPA has developed standards for ambient air concentrations of criteria pollutants. Coconino County is currently within attainment or unclassified status for all criteria pollutants (EPA 2008a).

The CAA includes measures to Prevent Significant Deterioration (PSD) of air quality in areas where air quality is better than the national standards established by the EPA. One of the purposes of the PSD program is "to preserve, protect, and enhance air quality in national parks, national wilderness areas, national monuments, national seashores, and other areas of special natural, recreational, scenic or historic value." The PSD program divides areas into two classes based on the potential for degradation due to air quality. Class I areas receive heightened protection through more stringent requirements and include some national parks, monuments, and wilderness areas. All other areas are designated as Class II. The wind park study area, proposed transmission tie-line, and Western's switchyard are located within Class II areas. The nearest Class I areas are located in the Sycamore Canyon Wilderness Area approximately 30 miles to the west, and Mazatzal Wilderness Area approximately 40 miles to the south of the wind park study area.

To implement Federal air quality standards, ADEQ evaluates pollutant emissions from various types of facilities and determines if regulatory operating permits are required. Pollutant-specific emissions thresholds are used to determine whether a new Class II Air Quality Permit would be required for an emissions source. Class II General Permits have also been developed for categories of sources, such as rock crushers and concrete batch plants. A source is considered "major" if it has the potential to emit 250 tons per year (tpy) or more of any criteria pollutant from non-fugitive emissions while located in an attainment area. Additionally, a source would be considered major if it would increase ambient pollutant levels by 1 micrometer^3 (μ/m^3) within 10 kilometers of a Class I area.

Hazardous Air Pollutants

The Federal Hazardous Air Pollutants (HAP) program considers a source major if it has the potential to emit at least 10 tpy of a single HAP or 25 tpy of a combination of HAPs. A minor source would emit 1 to 10 tpy of a single or 2.5 to 25 tpy of a combination of HAPs.

Climate Change/Greenhouse Gas

According to the 2009 report, *Global Climate Change Impacts in the United States*, climate-related changes have already been observed and are expected to grow. Rapid rates of warming are anticipated to lead to particularly large impacts on water resources and natural ecosystems. Water supplies are projected to become increasingly scarce while flooding events would become more frequent. Increasing temperature, drought, wildfire, and invasive species would accelerate the transformation of traditional landscapes. Climate change could exacerbate environmental impacts from the proposed project. Recent, rapid warming trends in the Southwest region would affect moisture content in vegetation, reducing forage for cattle and wildlife, and increase wildfire frequency and severity. These conditions would make revegetation of disturbed areas more difficult and impose an additional stress on wildlife.

The Arizona Climate Change Advisory Group (ACCAG), established in 2005, has conducted greenhouse gas (GHG) emissions and projections through 2020. In 2000, electricity production accounted for approximately 40 percent of Arizona's GHG emissions. In 2009, Arizona electric power generation accounted for 53.5 million metric tons of CO_2, the largest component of GHG emissions. As a whole, the industry required 0.48 metric ton of CO_2 per megawatt hour (MWh) of electricity produced. Table 3.5-1 presents DOE data of select GHG emissions in Arizona for the production of electric power in 2009. Projections indicate that if current trends continue, emissions from electricity production would be 75 percent above 2000 levels. The ACCAG developed a climate change action plan with recommendations for reducing GHG emissions in Arizona. The recommendations included mandates and support for renewable energy production.

TABLE 3.5-1 ARIZONA ELECTRIC POWER INDUSTRY GHG EMISSIONS BY ENERGY SOURCE, 2009						
Energy Source	**Generation (Megawatt hours)**	**CO_2 (Metric tons)**	**SO_2 (Metric tons)**	**NO_x (Metric tons)**	**Total Emissions (Metric tons)**	**Metric Tons of Emissions per Megawatt Hour**
All Sources	111,971,250	53,523,638	32,883	61,622	53,618,143	0.4780
Coal	39,706,817	39,202,857	32,786	57,684	39,293,327	0.9873
Natural Gas	34,739,170	14,269,696	73	3,360	14,273,129	0.4108
Other Biomass	21,990	0	0	332	332	0.0000
Wood and Wood Derived Fuels	136,641	0	19	194	213	0.0000
Petroleum	62,699	51,085	5	51	51,141	0.8148
Nuclear	30,661,851					
Hydroelectric Conventional	6,427,345					
Wind	29,545					
Solar Thermal and Photovoltaic	14,145					
Pumped Storage	169,480					
Source: DOE 2009						

On December 7, 2009, the EPA Administrator signed two distinct findings regarding greenhouse gases under section 202(a) of the Clean Air Act:

- *Endangerment Finding*: The EPA Administrator finds that the current and projected concentrations of the six key well-mixed greenhouse gases (i.e., carbon dioxide [CO_2], methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride [SF_6]) in the atmosphere threaten the public health and welfare of current and future generations.
- *Cause or Contribute Finding*: The EPA Administrator finds that the combined emissions of these well-mixed greenhouse gases from new motor vehicles and new motor vehicle engines contribute to the greenhouse gas pollution which threatens public health and welfare.

These findings do not themselves impose any requirements on industry or other entities. However, this action is a prerequisite to finalizing the EPA's proposed greenhouse gas emission standards for light-duty vehicles, which were jointly proposed by EPA and the U.S. Department of Transportation's National Highway Safety Administration on September 15, 2009 (EPA 2009a).

3.5.2 Environmental Consequences

3.5.2.1 Standards of Significance

Air quality impacts would be considered significant if any of the following conditions were met:

- Emissions generated by construction or operation of the project components would violate any air quality standards.

- Emissions would compromise the attainment status of the area.
- Emissions would cause the significant deterioration of a Class I airshed.
- Project implementation would result in a long-term HAP major source.

Air quality impacts would be greatest during the construction period with fugitive dust emissions primarily from earthmoving and construction vehicle exhaust emission. In addition, there are fugitive and point sources associated with the concrete batch plant (ERM 2011). Operational impacts would be restricted to dust and internal combustion engine emissions due to periodic maintenance vehicle traffic because WTGs do not have emissions.

3.5.2.2 Foresight's Proposed Project and Proposed Federal Actions

This section discusses potential air quality impacts from emissions of pollutants during construction and operation of the proposed wind park, transmission tie-line, and switchyard. Direct impacts could be associated with construction, operation, and maintenance of project components, including WTGs, met towers, new access roads, collection lines, step-up substations, rock crusher, concrete batch plant, O&M facility, transmission tie-line, and Western's proposed switchyard. Air quality impacts beyond the immediate study area are not predicted, because vehicular dust generation and pollutants from combustion engines are relatively localized at the point of origin and are not permanent.

Table 3.5-2 presents estimated emissions of criteria pollutants at the project site for up to 18 months of construction activities. The specific schedules for each portion of the construction, the affected or disturbed areas, and the roster of vehicles planned, were developed from the information presented in Chapter 2. Total construction emissions are estimated at 210 tons, with PM emissions totaling 93 tons and NO_x 51 tons. Actual construction phase emissions are expected to be significantly below the estimated levels shown in the table (ERM 2011).

TABLE 3.5-2
ESTIMATED PROJECT CRITERIA POLLUTANT EMISSIONS

Emission Source Category	**Total Project Construction (tons)[1]**				
	PM_{10}	**PM**	**NO_X**	**CO**	**VOC**
Wind Park, Roadways, and Other Construction Activities (500 MW Plant)					
Earthmoving and Vehicles – site prep and road construction[2]	1.65	2.48	11.0	4.3	1.2
Construction Activities – borrow pit/ concrete plant[2]	1.74	1.83	8.6	6.2	1.8
Construction Vehicles – wind park	2.49	2.49	31.3	11.2	3.3
Earthmoving and Construction Activities – transmission tie-line[2]	0.16	0.31	included in wind park		
Borrow Pit and Crushing Plant Operation[3]	1.56	3.14	–	–	–
Concrete Batch Plant Operation[3]	30.5	82.9	–	–	–
Total Construction Emissions	38.1	93.1	50.9	21.7	6.3

Source: ERM 2011

[1]Calculations based on roster of equipment and activity on-site based on the Project Description in Section 2.
[2]Earthmoving activity estimates assume 37 acres of plant site, 4 acres borrow pits, and 7 acres of the linear transmission corridors would be under active construction in a single day. Emission factors used for general heavy industry construction activity from URBEMIS Version 9.2.4 of 20 lbs PM_{10}/acre-day.
[3]Aggregate and concrete batch plant emission factors for fugitive and controlled point sources from U.S. EPA Document AP-42, Chapter 11. The inclusion of an on-site batch plant is included in the proposed project.

Construction

Construction emissions can vary substantially from day-to-day depending on the level of activity, the specific operations, and the prevailing meteorological conditions (ERM 2011). Air quality impacts from construction activities would be temporary and limited to the construction period. These temporary impacts would include fugitive dust, vehicle and equipment emissions, and operation of the concrete batch plant and rock crusher.

Fugitive Dust

Construction activities would produce fugitive dust from the following general operations:

- Construction-related traffic on unpaved site roads.
- Ground disturbance from clearing and grading activities.
- Excavation activities, including blasting if required, for on-site borrow pits, WTG foundations, transmission tie-line foundations, and substation equipment foundations.
- Rock crusher and concrete batch plant operations.

Approximately 90 tons of fugitive dust can be expected to be released as a result of wind park construction activities (Table 3.5-2). Dust control measures that provide practical and reasonable control at construction sites are listed in Table 2.7-1 under Air Quality. These RPMs as proposed by Foresight for construction of the proposed wind park and portions of the transmission tie-line on private and State trust lands, by the Forest Service for portions of the transmission tie-line that crosses Forest Service-managed lands and the proposed switchyard, and by Western for construction of the proposed switchyard. With implementation of the RPMs, construction activities would not violate air quality standards or exceed air quality significance thresholds.

Vehicle and Equipment Emissions

Vehicles are considered a mobile emissions source and are not regulated or subject to air quality permit requirements. Construction activities would cause vehicle emissions from the following sources:

- Exhaust from the diesel construction equipment used for site preparation, grading, excavation, and construction of wind park structures, transmission tie-line, and switchyard.
- Exhaust from diesel trucks used to deliver equipment, fuel, and construction supplies to the construction sites.
- Exhaust from vehicles used to transport water, rock, top soil, and concrete.
- Exhaust from water trucks used to control construction dust emissions.
- Exhaust from vehicles used to transport workers and materials to and from and around the construction site.
- Exhaust from various other equipment, including diesel-powered welding machines, electric generators, air compressors.

For construction vehicles and equipment, industry practices to reduce tailpipe emissions include the use of diesel engines that meet current EPA emission performance standards for engines between 100 and 750 horsepower. Table 3.5-2 assumes the use of construction vehicles and equipment that are compliant with EPA Tier 2 and estimates gaseous pollutant emission factors based on this level of performance. Another best practice for reducing tailpipe emissions is the use of ultra-low sulfur diesel fuels for all equipment for which such fuel is technically feasible. This practice substantially reduces emissions of both SO_2 and PM (ERM 2011).

RPMs have been proposed by Foresight for vehicle and equipment use during construction of the proposed wind park and portions of the transmission tie-line on private and State trust lands, by the Forest Service for portions of the transmission tie-line that crosses Forest Service-managed lands and the proposed switchyard, and by Western for vehicle and equipment use during construction of the proposed switchyard (see Table 2.7-1 under Air Quality). With implementation of the RPMs, vehicle and equipment use during construction would not violate air quality standards or lead to significant impacts. No additional mitigation would be required to minimize vehicle use air impacts.

Concrete Batch Plant and Rock Crusher

Temporary equipment at the proposed wind park would include a portable concrete batch plant and a portable rock crusher which would avoid the shipping of concrete and aggregate to the project site. Native rock would be quarried within two-acre borrow pit(s) and loaded into the rock crusher by front-end loader(s). From the crusher, the material would pass through a screening plant and be stockpiled for use. The portable batch plant would blend and load approximately 120 tons of concrete per hour. Ready-mix concrete would be required for foundations for the WTG structures, O&M building, transmission tie-line structures, and other facilities. The batch plant would be in operation during road building and foundation construction phases, approximately six to eight months, for approximately 10 to 12 hours per day, up to six to seven days per week. It is assumed that both the batch plant and rock crusher would use diesel-powered generators during operations.

Operation of the batch plant and rock crusher would emit approximately 118 tons per year of criteria pollutants and would not require a major source permit. Dust control systems would be in place and maintained in good operating condition during all periods of crusher and batch plant operation. Emissions controls for stationary processing equipment would include cyclones, fabric filters, and enclosures for the crusher chute, discharge belt, and other transfer points. In addition, water sprays, physical enclosures, or other palliative treatments would be applied as needed near all emissions, transfer, and loading points along the mixing and crushing circuits to control dust. The movement of heavy trucks over unpaved or dusty surfaces in and around these on-site plants would be controlled by good maintenance, wetting of the road surface with water, and/or the use of dust suppressants.

As described in Table 1.3-1, operation of the rock crusher and concrete batch plants would require a minor source permit from ADEQ. The construction contractor would obtain authorization to operate under the general permits available for these facilities and would comply with all terms and conditions of the permit(s). As a result of the temporary use of these facilities, the dust suppression activities and the BMPs associated with the necessary permits, air quality impacts from the concrete batch plant and rock crusher would not violate air quality standards. Applicable air quality significance thresholds listed in Section 3.5.2.1 would not be exceeded.

A material and concrete source for Western's proposed switchyard has not been identified. Typically, the construction contractor selected by Western to construct a switchyard would be responsible for securing material and concrete for the construction. Western would require that any new sources be reviewed and cleared for use in accordance with regulatory requirements before authorizing materials for construction.

Operation

Impacts to air quality as a result of operation of the proposed wind park, transmission tie-line, and switchyard are expected to be negligible (BLM 2005). The proposed WTGs and transmission tie-line would produce no air emissions, because no fuel would be burned to produce energy. Other facilities such as the O&M building would use electricity or propane to heat and cool the structure, producing some air emissions on an intermittent basis. Operation of the wind park would have a net benefit to air quality, as wind energy produces no air emissions, substantially less than other energy generation sources such as

a coal fired power plants which would average 2,249 lbs (1.02 metric ton) of CO_2 (the most commonly measured greenhouse gas) per megawatt hour produced. The proposed project could displace a small amount of CO_2 emissions, between 205 and 495 metric tons during annual operations (DOE 2009).

Operational traffic is expected to consist mainly of commuter vehicles and pickup trucks traveling between the WTGs, O&M facility, and transmission tie-line structures for inspection and maintenance. Routine maintenance activities would include road maintenance and lubricant changing, which could generate emissions related to combustion from vehicle travel, fugitive dust, and small amounts of volatile organic compounds (VOC) during periodic lubricant replacement. Major maintenance activities could include replacement or repair of major wind park components. This could require the operation of heavy machinery, depending on the specific activity required. Impacts would be temporary and limited to combustion from equipment and fugitive dust from road travel and potential earth moving activities. Routine and major maintenance activities are temporary and site specific, so only minimal impacts would be expected. Therefore, operation of the wind park would not negatively impact air quality.

Western's proposed switchyard and the proposed step-up substations could include sulfur hexaflouride (SF_6) gas-filled circuit breakers. Sulfur hexafluoride is another GHG listed in EPA's endangerment finding. Since 2000, Western has had an aggressive program to identify and repair leaks throughout the transmission system to reduce SF_6 emissions. Western personnel would monitor the use, storage, and replacement of SF_6 to minimize any releases to the environment. The likelihood for accidental release is low, as SF_6 gas is supplied in sealed units and is factory-certified not to leak. During operation of the new switchyard, authorized Western personnel would conduct periodic inspections and service equipment as needed. Properly trained maintenance personnel would monitor and manage the use, storage, and replacement of SF_6 to minimize any releases to the environment. During inspections, equipment would be monitored for detection of leaks, and repairs would be made as appropriate.

Western's proposed switchyard would include a backup generator. The size of the backup generator would be determined during the design phase for the switchyard, but it is expected to be under 325 horsepower and exempt from ADEQ permitting requirements (ADEQ 2009a). The generator would be used during periodic testing and in the event of a power outage at the switchyard, since station service would be provided through a proposed station service transformer. The generator's engine would cause periodic air emissions, but below any thresholds that would violate air quality standards.

3.5.2.3 Alternative Transmission Tie-line Corridor

Air quality impacts associated with construction and operation of the alternative transmission tie-line would be similar to those described for Foresight's Proposed Project. The alternative would have slightly more (approximately one acre) permanent ground disturbance from the construction of an additional mile of access road resulting in an incremental increase in fugitive dust and vehicle emissions.

3.5.2.4 No Action Alternative

No short or long term air quality impacts would result through implementation of the No Action Alternative. Under this alternative, Western would not approve an interconnection for the Grapevine Canyon Wind Project and the Forest Service would not issue a permit for the transmission tie-line proposed for the wind park. The wind park, transmission tie-line, and switchyard would not be constructed, and the air quality of the area would remain unchanged.

3.6 WATER RESOURCES

3.6.1 Affected Environment

3.6.1.1 Resource Evaluation Area

The water resources evaluation area for this analysis extends one mile beyond the boundaries of the wind park study area, the transmission tie-line right-of-way, and the proposed switchyard. Drainages and aquifers were surveyed for downstream conditions in order to understand the potential for indirect project impacts. Maps, data, and publications about local water resources were gathered from websites maintained by ADEQ, Arizona Department of Water Resources (ADWR), University of Arizona, USFWS, EPA and NOAA. These were reviewed for information pertinent to evaluating the potential impacts on water resources from the proposed project components. Additional unpublished data was reviewed, including a preliminary determination of jurisdictional wetlands and waters developed from field visits and review of aerial photographs, USGS topographic quadrangle maps, National Wetland Inventory maps, and the National Hydrology Dataset (Atwell 2011).

3.6.1.2 Characterization

Climate

The water resources evaluation area is located in the Plateau Uplands Hydrogeologic Province of Arizona, which is a high desert plateau region where landforms are dominated by deeply incised canyons, high isolated mesas and buttes, and volcanic peaks (Cooley 1963; Montgomery and Harshbarger 1989). While much of the water resources evaluation area is semi-arid, portions closer to the Mogollon Rim receive higher amounts of rainfall. Annual precipitation averages between 10 and 18 inches (ADWR 2009a). Precipitation is variable year to year, and decadal swings of 10 to 20 years between drought and wet conditions are typical (ADWR 2009a). The driest months are April, May, and June and most moisture occurs in July and August (WRCC 2009a). Table 3.6-1 depicts typical monthly weather conditions 20 miles from the project site in Winslow, Arizona.

TABLE 3.6-1
HISTORICAL CLIMATE STATISTICS FOR WINSLOW, ARIZONA

Month	Daily Max Temp[1]	Daily Min Temp[1]	Normal Precip[2]	Max Snow, Ice, Hail[2]/Year of Occurrence	Wind Information		
					Mean Speed[3]	Predominant Direction	Fastest Mile[3]/ Year
January	45	19	0.5	11.3/1987	7.1	ESE	56/1951
February	53	25	0.5	10.7/1973	8.5	SW	63/1971
March	61	30	0.6	11.0/1973	10.6	SW	58/1975
April	70	37	0.3	4.8/1977	11.3	SW	56/1957
May	80	45	0.3	0.6/1978	10.9	SW	53/1950
June	91	54	0.3	0	10.6	SW	52/1953
July	94	63	1.2	0	9.0	SW	59/1954
August	91	61	1.4	0	8.4	ESE	43/1966
September	84	53	0.9	T/1945	8.2	SW	40/1950
October	72	40	0.9	8.2/1961	7.6	ESE	49/1970
November	58	29	0.6	7.4/1952	7.3	SE	46/1964
December	46	20	0.6	39.6/1967	6.7	SE	52/1966
Year	70	40	8.0	39.6/1967	8.8	SW	63/1971

[1]degrees Fahrenheit; [2]inches; [3]miles per hour
Source: Western Regional Climate Center 2009a

Most of the annual precipitation in Arizona occurs in late summer and mid-winter. Precipitation is provided by winter storms of the Pacific Ocean system and annual summer monsoon storm systems originating in the southern Pacific Ocean and the Gulf of Mexico (Jones 1993). Late summer monsoons provide intense rainstorms, generally of relatively short duration. Winter precipitation includes longer duration rains and snowfall. Losses of rainfall and snow to evapotranspiration and sublimation are high in the region.

Temperatures in Arizona have risen since the mid-1970s. Since 1976, the average annual temperature increased by 2.5 degrees Fahrenheit (F). Going forward, average annual temperature in the Southwest is projected to rise by five to eight degrees F by the end of the century (Lenart 2007).

Groundwater

The water resources evaluation area lies over the Little Colorado River Plateau Groundwater Basin. The basin is comprised of consolidated crystalline and sedimentary rocks and three regional aquifers. The shallowest aquifer, the Coconino Sandstone, which is part of the C-aquifer system, is beneath the project site. The C-aquifer generally extends from the Mogollon Rim in the south, northeast into New Mexico, and west beyond the Little Colorado River. Groundwater in the aquifer generally flows north and west from a primary recharge area along the Mogollon Rim and Defiance Plateau.

The regional aquifers are relatively deep (generally several 100 feet to more than 1,000 feet below land surface) and occur in sandstone and limestone units that are gently folded and exhibit relatively shallow regional dips. Groundwater movement in these aquifers occurs chiefly via fracture zones which are most abundant along major fault systems (Montgomery et al. 2000). The land surface over most of the study area consists of fractured limestone which provides for rapid infiltration of precipitation and results in meager surface water runoff (Montgomery and Harshbarger 1989). As a result, the Plateau Uplands Province has a small number of perennial streams and rivers. The principal source of groundwater recharge in the water resources evaluation area is infiltration of precipitation in areas of higher topographic altitude and abundant fracturing of the aquifers and overlying rocks, such as along the Mogollon Rim to the south and Anderson Mesa to the west. Summer precipitation is believed to provide limited groundwater recharge due to high rates of evapotranspiration. Winter rains and snowmelt provide most of the groundwater recharge to the aquifers in the area (Montgomery and Associates 2005).

Saturated thickness of the C-aquifer is about 1,000 feet in the Lake Mary well field (the primary water source for the City of Flagstaff) northwest of the evaluation area (Montgomery and Associates 1993) and about 600 feet along the Little Colorado River Valley north of the evaluation area (Bills et al. 2007). Saturated thickness decreases to the northwest as groundwater in the C-aquifer gradually drains to deeper aquifers; the C-aquifer is completely drained in the Cameron area. The major discharge from the Little Colorado River Plateau Groundwater Basin is at Blue Springs along the lower Little Colorado River. While an estimated 413 million acre-feet of water is stored in the C-aquifer, recharge rates are estimated to be 319,000 acre-feet per year (ADWR 2009a).

Local aquifers in the water resources evaluation area are important sources for smaller water supplies. These may occur in alluvial deposits along washes and stream channels (ADWR 2009a) and in small, thin, and discontinuous perched groundwater zones in the Toroweap and Kaibab Formations. Municipal, industrial, and agricultural activities withdrew around 105,000 acre-feet from the groundwater basin annually from 2001 to 2005 (ADWR 2009a).

A records inventory for 20 registered wells within or in the immediate vicinity of the water resources evaluation area is given in Table 3.6-2. All of these wells are associated with the ranch lands to the east of Anderson Mesa; no wells were identified within one mile of the transmission tie-line alignment on

National Forest System lands. Well locations are shown on Figure 3.6-1. Water levels in the C-aquifer where it is penetrated by wells in the Flying M Ranch area are between 500 and 1,000 feet below land surface. Reported well yields range from 5 to 50 gallons per minute (gpm). Most of the groundwater use is for stock and domestic purposes. AGFD, ASLD, and the Hopi Tribe have registered drill holes in the area (ADWR 2009b). Inspection of sparse hydrograph data for wells in the evaluation area indicate that groundwater levels have raised tens of feet during the past several decades (Montgomery and Associates 2005). Table 3.6-2 identifies six wells owned by Flying M Ranch, four of which have been identified as potential production wells for construction.

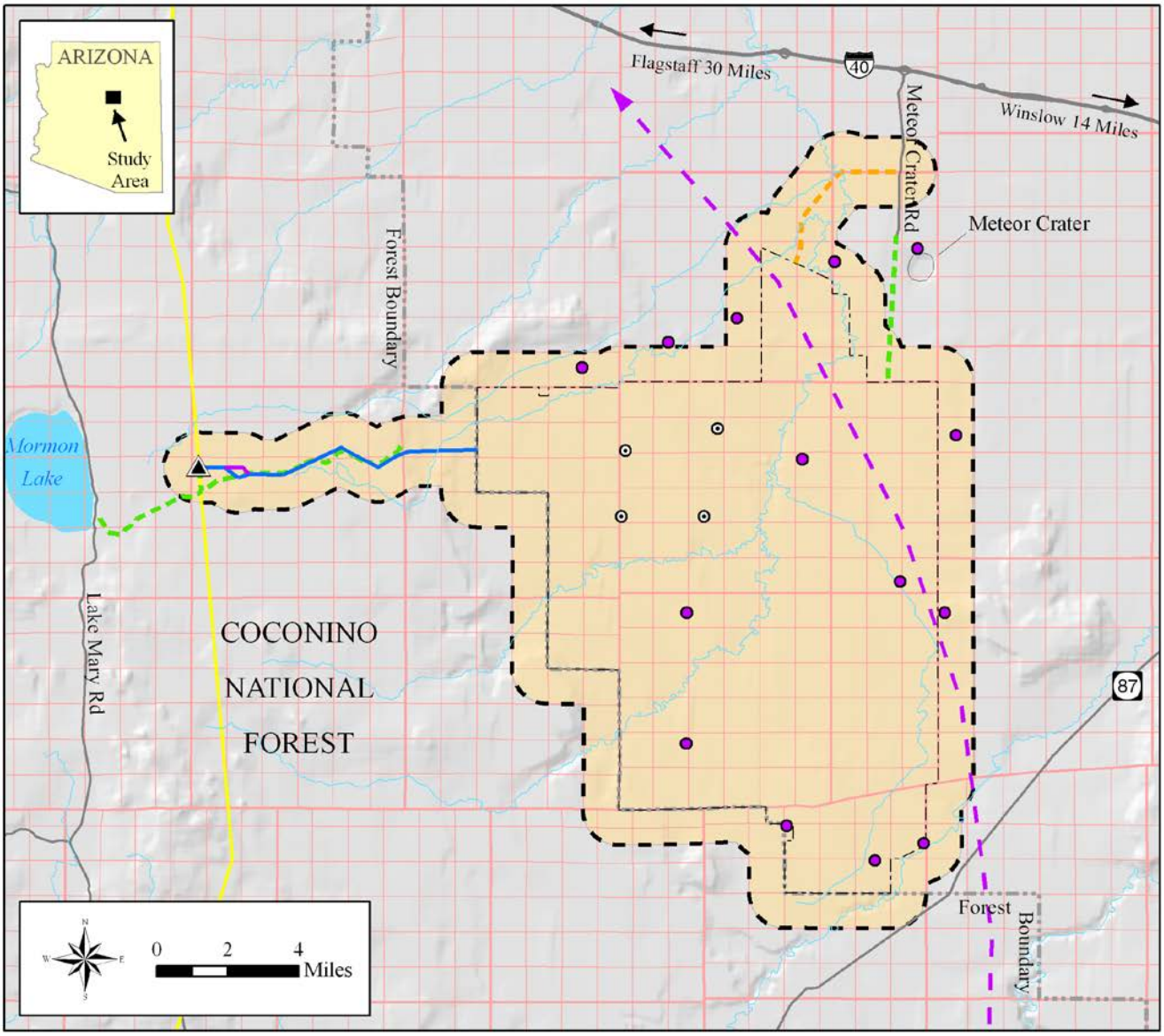
TABLE 3.6-2
SUMMARY OF RECORDS FOR REGISTERED WELLS
IN THE WATER RESOURCES EVALUATION AREA

ADWR Reg No./Local Identifier	Well Use	Water Use	Install Date	Well Depth (ft, bls)[1]	Water Level at Time of Install (ft, bls)[1]	Casing Depth (ft, bls)[1]	Casing Diameter (inches)	Pump Rate (gpm)[2]	Tested Rate (gpm)[2]	Draw Down (ft)	Owner[3]
55-631362/ A16012009BBB	Water production (exempt)	Stock	1930	1,000	946	8	8	15	15	—	BT
55-208785/ A16012012DAA	Monitor	Monitoring	—	—	—	—	—	—	—	—	SR
55-208786/ A16012012DAA	Monitor	Monitoring	2005	42	9	37	4	—	—	—	SR
55-649925/ A16012014ABB	Water production (exempt)	Irrigation, stock, domestic	—	600	560	—	8	35	35	—	HE
55-646325/ A17012005DAA	Water production (exempt)	Stock, domestic	1947	940	850	20	10	5	5	—	FM*
55-547017/ A17012029ADA	Water production (exempt)	Stock	—	930	—	20	8	—	—	—	FM*
55-606821/ A17013007CBA	Water production (exempt)	Stock	1971	800	760	40	8	12	—	—	HT
55-509618/ A18012007CCD	Water production (exempt)	Stock	1985	1,045	960	20	0	25	25	20	FM*
55-509619/ A18012009ADB	Water production (exempt)	Stock	1985	790	670	20	0	25	25	40	FM*
55-631371/ A18012013BBD	Water production (exempt)	Stock	1930	900	680	12	8	15	15	—	CT
55-509620/ A18012019CCB	Water production (exempt)	Stock	1985	1,010	910	20	0	25	25	30	FM*
55-509617/ A18012021CDA	Water production (exempt)	Stock	1985	900	810	20	0	25	25	30	FM*
55-631359/ A18012535DAD	Water production (exempt)	Stock, domestic	1945	680	590	12	8	15	15	—	CT
55-509228/ A18013018000	Mineral exploration	None	—	—	—	—	—	—	—	—	RM

TABLE 3.6-2
SUMMARY OF RECORDS FOR REGISTERED WELLS
IN THE WATER RESOURCES EVALUATION AREA

ADWR Reg No./Local Identifier	Well Use	Water Use	Install Date	Well Depth (ft, bls)[1]	Water Level at Time of Install (ft, bls)[1]	Casing Depth (ft, bls)[1]	Casing Diameter (inches)	Pump Rate (gpm)[2]	Tested Rate (gpm)[2]	Draw Down (ft)	Owner[3]
55-560612/ A19011035ADD	Water production (non-exempt)	Irrigation, stock	1997	1,140	1,000	1140	10	40	30	60	AZ
55-522224/ A19012027BAC	Abandoned	Stock	1988	370	—	—	—	—	—	—	AZ
55-522652/ A19012027BAC	Water production (non-exempt)	Stock	1988	776	590	776	6	42	50	60	AZ
55-628232/ A19012029CD0	Water production (exempt)	Irrigation, stock	1945	753	710	753	9	13	13	—	AZ
55-631852/ A19012513BAD	Water production (exempt)	Stock, domestic	1949	690	610	690	5	28	28	—	MG
55-631374/ A19012515CBB	Water production (exempt)	Stock	1950	760	531	12	8	15	15	—	CT

Source: ADWR 2009b
[1] feet below land surface
[2] gallons per minute
[3] AZ=Arizona Game and Fish Department; BT=Bar T Ranch, Inc.; CT=Chilson Family Trust; FM=Flying M Ranch, Ltd.; HE=Hasten and Eckles; HT=Hopi Tribe; MC=Meteor Crater; RM=Rocky Mountain Energy; SR=Salt River Maricopa Indian Community.
– not available
* Flying M Ranch Well



Legend

- Wind Park Study Area
- Water Resources Evaluation Area
- Proposed 345-kV Tie-line Alignment
- Alternative 345-kV Tie-line Alignment
- Proposed New Site Access Road
- Existing Site Access Road
- Proposed Interconnection Switchyard
- Existing Western 345-kV Transmission Line
- Flying M Ranch Registered Well
- Other Registered Well
- Direction of Subflow in "C" Aquifer
- Consolidated Crystalline and Sedimentary Rocks

Groundwater Conditions and Well Locations

Grapevine Canyon Wind Project

Source: ADWR 2009
Montgomery & Associates 2010

FIGURE 3.6-1

Surface Water

The water resources evaluation area is located within the Little Colorado River watershed. The initial phase of the wind park study area is mostly comprised of upland topographic depressions and small tributary headwaters that do not have frequent flows (Atwell 2011). There are no perennial steams or riparian areas associated with intermittent streams within the water resources evaluation area. In addition, no springs or seeps were identified within the water resources evaluation area. The primary drainage is Canyon Diablo (USGS hydrological unit 15020015) and its tributary, Grapevine Canyon, that send accumulated flow approximately 33 miles to the Little Colorado River. The two ephemeral streams associated with these features drain a large portion of the wind park study area from the southwest to northeast. Yaeger Canyon, also ephemeral, drains the northwest corner of the wind park study area. The southern portions of the wind park study area drain toward Jack's Canyon, an intermittent stream just beyond the wind park study area boundary. See Section 3.2.1.2 regarding riparian areas that may be associated with the canyons. Numerous other named and unnamed ephemeral streams and drainages are found within the wind park study area, generally flowing only during storm events and for short periods of time.

Unnamed ephemeral drainages are also located along the proposed transmission tie-line corridor on National Forest System lands. These drainages are typically small in size and are not deeply incised. These features are not riparian in character as they only have water during storm events for short periods of time. No springs or seeps were identified within the tie-line corridor.

The largest body of water in the water resources evaluation area is the 88-acre Yaeger Lake located at the top of Yaeger Canyon on the Forest. The proposed transmission tie-line would pass within one-quarter mile of the lake. Other earthen catchment structures are an acre or less in size (USFWS 2009a). Artificial surface water catchments, or stock tanks, are numerous within the wind park study area; there are over 36 tanks for watering livestock (ADWR 2009b). However, farm and stock ponds are not generally protected under the Clean Water Act (EPA 2011). In total, surface water diversions consumed 51,000 acre-feet annually from 2001 to 2005 (ADWR 2009a). Figure 3.6-2 depicts the water resources evaluation area's surface water conditions.

The drainages within the water resources evaluation area are part of a very rural and sparsely settled landscape. They have not been studied for flooding hazards by the Federal Emergency Management Agency (FEMA) and are, therefore, described as "areas of undetermined, but possible, flood hazard" (Aber 2009). No impaired surface waters have been identified in the water resources evaluation area, although several reservoirs to the west beyond the water resources evaluation area were added to the statewide list of impaired waters because fish tested positive for mercury (ADEQ 2009b).

Wetlands and Waters of the United States

Under Section 404 of the Clean Water Act, the U.S. Army Corps of Engineers (USACE) has authority to regulate the discharge of dredged and fill material into waters of the U.S. Waters of the U.S. include non-navigable tributaries that typically flow year-round or have flow at least seasonally (e.g., typically three months).

Wetlands, which are special aquatic sites, can be jurisdictional under Section 404 as a subset of waters of the U.S. Wetlands, as defined by the EPA and the USACE in the Wetland Delineation Manual (U.S. Department of Army, Corps of Engineers, Environmental Laboratory 1987), are "those areas that are inundated or saturated by surface or groundwater at a frequency and duration to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." However, field review of the water resources evaluation area and a review of National Wetlands Inventory maps did not identify wetlands or special aquatic areas. Furthermore, wetlands under

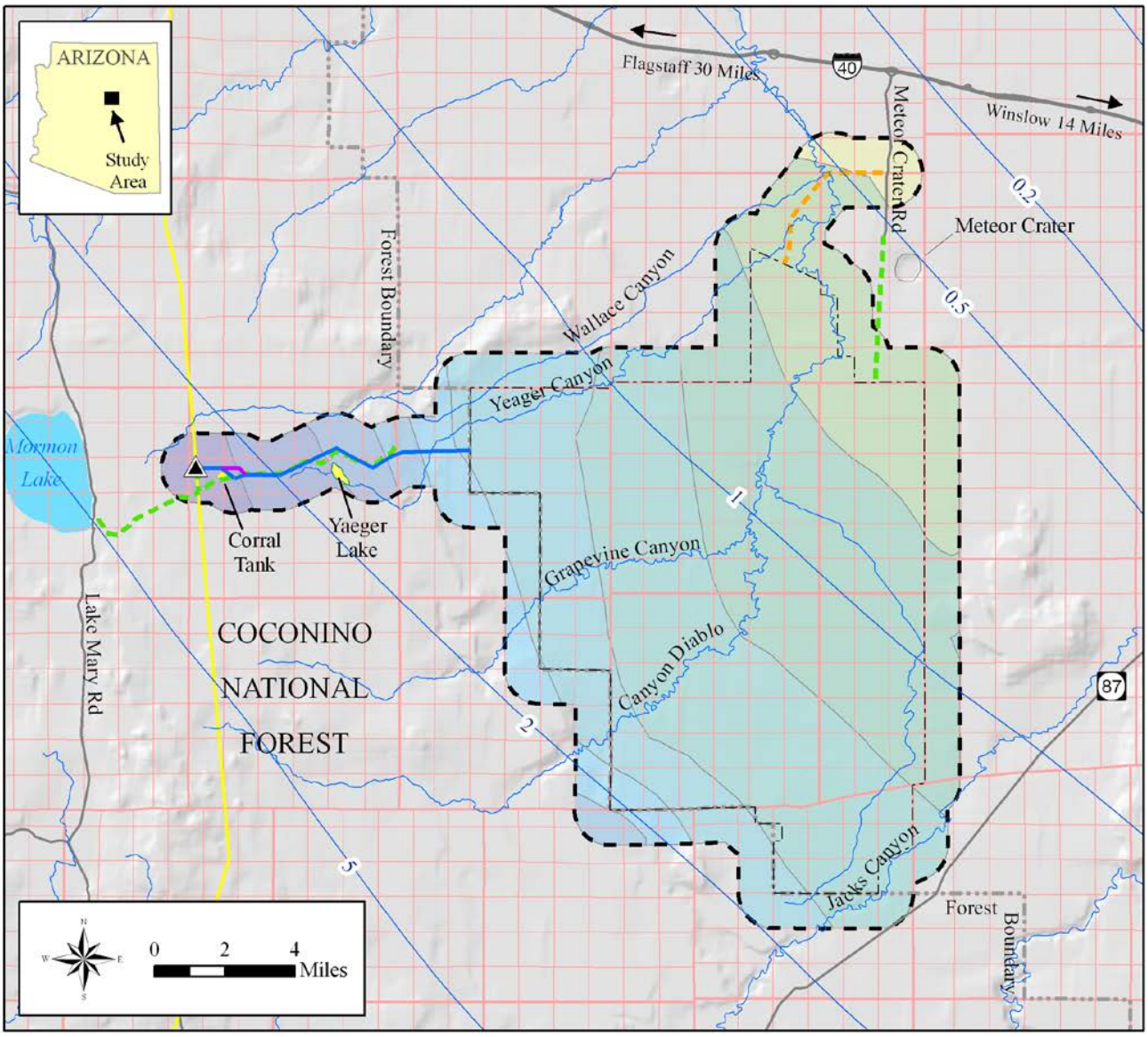
the jurisdiction of USACE were not found during additional field review of the initial phase of the wind park (Atwell 2011).

However, field review did inventory potential jurisdictional waters within limits of the project study area (Table 3.6-3 and Figure 3.6-3). A preliminary Jurisdictional Determination has been prepared for the initial phase study area for review and determination by the USACE (Atwell 2011). The balance of the wind park study area was evaluated based on field observation to be assembled into presentation for future phase(s) of wind park development at a later date. The wind park study area comprises 262 miles or 253 acres of washes that are potentially under the jurisdiction of USACE (Atwell 2011).

TABLE 3.6-3
ESTIMATED EXTENT OF JURISIDICTIONAL WATERS,* UP-TO-500MW PROJECT STUDY AREA

Project Area	**Stream Miles of Potential Jurisdictional Waters**	**Approximate Acres of Potential Jurisdictional Waters**
Wind Park	261.3	252.9
Tie-Line	0.2	0.1
Site Access Road	0.4	0.4
Switchyard	0.0	0,0
Total	261.9	253.4

Source: Atwell 2011
*Actual jurisdictional waters are subject to the review and determination by USACE.



Legend

- Wind Park Study Area
- Water Resources Evaluation Area
- Proposed 345-kV Tie-line Alignment
- Alternative 345-kV Tie-line Alignment
- Proposed New Site Access Road
- Existing Site Access Road
- Proposed Interconnection Switchyard
- Existing Western 345-kV Transmission Line

Annual Precipitation in Inches

- 8-10
- 10-12
- 12-14
- 14-16
- 16-18
- 18-20
- 20-22
- 22-24
- 24-26
- 26-28

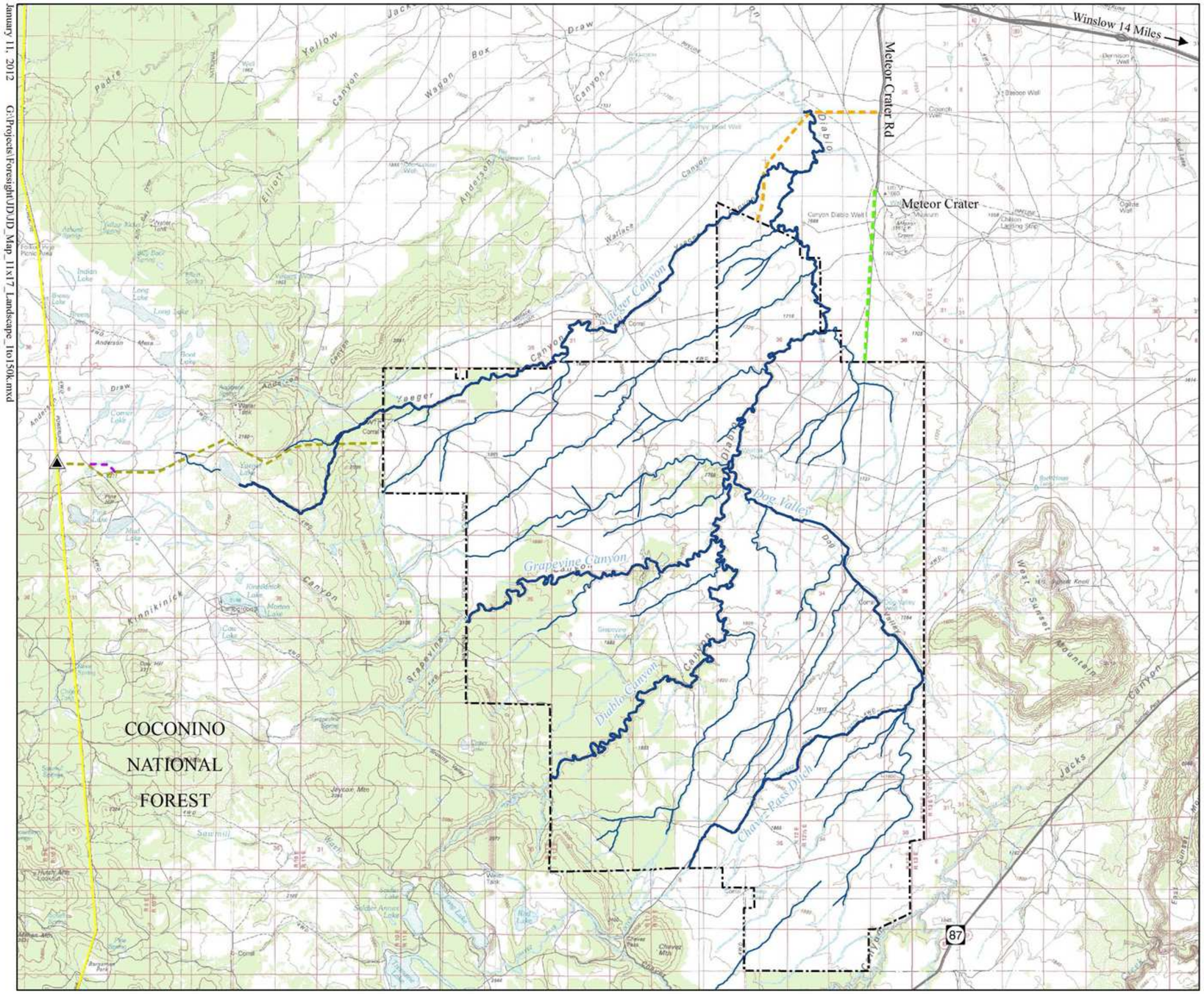
- Wetland/Reservoir
- Ephemeral Stream
- 2 Runoff Contour

Source: ADWR 2009
Montgomery & Associates 2010

Surface Water Conditions
Grapevine Canyon Wind Project

FIGURE 3.6-2

January 11, 2012 G:\Projects\Foresight\JD\JD_Map_11x17_Landscape_1to150k.mxd



Potential Jurisdictional Waters

Grapevine Canyon Wind Project

Legend

- Wind Park Study Area
- Alternative 345-kV Transmission Tie-Line
- Proposed 345-kV Transmission Tie-Line
- Proposed Access Road
- Existing Site Access Road
- Proposed Interconnection Switchyard
- Existing Western 345-kV Transmission Lines
- Projected Jurisdictional Feature
- Upland Feature (no jurisdictional implication)

Note:
The projected jurisdictional waters are based on field observations, assessments of aerial and topographic maps, and supporting document review. The features identified and project area are subject to evaluation by the United States Army Corps of Engineers.

0 1 2 Miles

FIGURE 3.6-3

The Forest Service has identified and inventoried wetlands on Forest Service-managed lands. In addition to Yaeger Lake, the Forest Service identified a second wetland within one mile of the proposed tie-line and switchyard. It is Corral Tank, an 11-acre seasonal water tank, located immediately north of FS 125 near Pine Hill.

3.6.2 Environmental Consequences

This section evaluates the proposed project components' potential impact on both limited surface water resources and on groundwater resources. Potential impacts to groundwater resources were evaluated by compiling a well inventory from ADWR records, reviewing pumping test results for the Lake Mary well field, and using data for the proposed water production wells to estimate water level drawdown impacts on the aquifer and the nearest wells of record. Potential impacts to jurisdictional waters were evaluated by compiling an inventory of drainages and conducting an assessment of the presence or absence of features such as defined bed and banks that are associated with an ordinary high water mark.

3.6.2.1 Standards of Significance

The proposed project components and alternatives would have significant adverse effect on water resources if they:

- Substantially degrade or contaminate surface water quality.
- Substantially deplete groundwater resources, including interfering with groundwater recharge.
- Cause a violation of the terms and conditions of a Federal, State, or local permit, including the loss or degradation of wetlands in violation of a USACE permit.
- Alter surface drainage patterns or stream channel morphology to the extent that vegetation communities and habitats are degraded or productivity is reduced for current resident species.
- Substantially alter the normal flow of a water body or normal drainage patterns and runoff or impede or redirect flood flows from the placement of a proposed project component within a 100-year flood hazard area.

3.6.2.2 Foresight's Proposed Project and Proposed Federal Actions

Foresight estimates that up to approximately 100 million gallons (307 acre-feet) of water would be required for constructing the proposed transmission tie-line and wind park, if fully built out to 500 MW. A concrete batch plant would consume 27–54 million gallons (83–166 acre-feet) of the total with the remainder used for dust abatement (watering the roads, rock crusher, etc.). One or more of the four on-site wells identified on Figure 3.6-1 are candidates to provide construction water for the proposed wind park.

Very little water would be used during wind park operations. The only water use during the operational phase of the wind park would be for "residential"-type functions at the operations and maintenance building (e.g., bathroom, sink). Water demand at the operations and maintenance building would be limited and be sourced from an existing on-site well or be delivered to the building by truck.

Water or another approved dust suppressant would be used to suppress dust during grading of the proposed switchyard. Other than using water for dust suppression, the proposed switchyard would not use additional water or have a permanent water supply.

Each criterion, or standard, of significance cited in Section 3.6.2.1 was evaluated to determine potential impacts from project implementation.

Degradation or Contamination of Surface Water Quality

Sound water and soil conservation practices would be maintained during construction, operation, and maintenance of Foresight's proposed project to protect topsoil and adjacent water resources and minimize soil erosion. As described in the RPMs in Section 2.7, efforts would be made during wind park and transmission tie-line construction activities to minimize disturbance to vegetation, drainage channels, and stream banks. Foresight and Western would apply standard Forest Service BMPs during construction of the proposed wind park, tie-line, and switchyard. Applicable Forest Service BMPs are provided in Appendix C. Furthermore, Foresight or construction contractors would obtain any and all necessary Federal and State permits required for storm water run-off, including an AZPDES permit. For the proposed tie-line, if required, Foresight would apply for a Nationwide Permit No. 12 for utility line activities administered under Section 404 of the Clean Water Act which contains general and permit-specific mitigation conditions for areas where proposed access roads and utility lines would impact waters of the U.S. Potential impacts to waterways from spills of chemicals or fuels used during construction or operation activities would be minimized by complying with the Forest Service BMPs. A Spill Prevention, Control, and Countermeasures (SPCC) Plan would also be implemented and followed. Spill containment materials would be available at all construction sites, and crews would be trained in spill response and cleanup. As a result, construction and operation activities associated with the wind park and transmission tie-line would only result in minimal, short-term degradation or contamination of surface water and should meet State water quality standards even though surface water is not monitored by the State. Thus, no substantial degradation or contamination of surface water quality would occur.

For the proposed switchyard, Western would require its construction contractors to manage waste concrete and washing of concrete trucks, provide measures to prevent and respond to spills of hazardous and non-hazardous substances, comply and implement appropriate identified Forest Service BMPs, and obtain an AZPDES permit associated with construction of its proposed switchyard. In addition, during the design of the switchyard, a determination would be made on the need for secondary oil containment for the proposed station service transformer. Based on these requirements, construction of Western's switchyard would not degrade or contaminate surface water quality.

Degradation or Depletion Groundwater Quantity

As described in Chapter 2, Foresight's Proposed Project would require about 307 acre-feet of groundwater. Potential impact of proposed groundwater pumping for construction was projected using an analytical groundwater flow model THWELLS with available data for wells and aquifer parameters (Victor 2010). THWELLS is an analytical model based on the Theis equation that computes water level drawdown for multiple pumping wells. For this analysis, it was assumed that the four Flying M Ranch wells identified as potential production wells for construction on Figure 3.6.2 would be equipped with pumps to provide groundwater for construction. These wells were each simulated to pump continuously at about 23.8 gpm for two years (to simulate the highest potential water pumping, which would only be in effect if the wind park is fully built out to 500 MW over two consecutive years); total continuous pumping rate was modeled at about 95 gpm for two years. Other assumptions for the simulation included:

- *Aquifer Transmissivity*: Transmissivity is a measure of the ability of an aquifer to transmit groundwater. Transmissivity is defined as the rate of groundwater movement under a 1:1 hydraulic gradient through a vertical section of an aquifer one foot wide and extending the full saturated thickness of the aquifer (Theis 1935). Units for transmissivity are gallons per day per foot (gpd/ft) width of aquifer. Transmissivity is estimated by multiplying the reported specific capacity for the four wells by 1,500 which is a standard conversion factor used for non-artesian aquifer conditions. This conversion resulted in estimated transmissivity ranging from 938 to 1,875 gpd/ft. This range is below the range of values calculated for C-aquifer production wells in the Lake Mary wellfield

(3,000–24,000 gpd/ft, Montgomery and Associates 1993) and, therefore, is considered to be conservative. The harmonic mean of the estimated project area transmissivity values is 1,250 gpd/ft and was used in the simulation for the C-aquifer. The harmonic mean of a set of values is a method of calculating the average value and is typically appropriate where the average of rates is desired. The harmonic mean is less than the arithmetic and geometric mean values and, therefore, provides a conservatively low estimate.

- *Specific Yield*: Specific yield describes the amount of recoverable groundwater stored in an aquifer under "water table" or non-artesian conditions. It is defined as the volume of water that would drain under gravity from a unit volume of aquifer material and is a unitless ratio. The value of 0.05 used for the Lake Mary wellfield model for the C-aquifer (Montgomery and Associates 1993) was also used for this simulation.
- *Aquifer Saturated Thickness*: Saturated aquifer thickness for the four wells ranges from 85 to 120 feet, which represents a small fraction of the total saturated thickness for the C-aquifer beneath the project site. A saturated thickness value of 100 feet was used in the simulation.

Maximum simulated water level drawdown in each pumped well was only 52 feet after two years of continuous pumping. The cone of depression (or drawdown) caused in the water table by each well has maximum depth at each well and decreases radially away from the well. During this same timeframe, the five-foot water level drawdown contour extends less than 800 feet from each well used for construction and would be negligible for wells more than one-half mile away. Therefore, the projected impacts at other existing wells in the vicinity are minimal and are not expected to affect the existing groundwater users' ability to continue their existing uses. After project construction, groundwater levels would be expected to return quickly to pre-project conditions, so construction activities would not substantially deplete groundwater resources, or interfere with groundwater recharge. Furthermore, no long-term effects to area springs and seeps would be expected.

The construction of Western's switchyard would require the use of water, or an approved dust suppressant, during grading and concrete pouring activities. Less than ten-acre-feet of water would be required at the substation site, assuming no dust suppression would be required for road improvements to the substation. Based on the low volumes of water required for substation construction and the lack of any permanent water usage, Western's substation would not deplete groundwater or other water sources.

Degradation or Elimination of Wetlands or Waters of the U.S.

Potential impacts to waters of the U.S. or wetlands identified by the Forest Service could result from construction, operation, and maintenance of the proposed wind park and transmission tie-line. Potential short-term impacts to regulated washes would result from the placement of temporary roads, undergrounding of utilities, and placement of staging areas, borrow pits, concrete batch plants, and parking areas. Permanent impacts from infrastructure development would result from the placement of new service roads, culverts, and WTGs. Potential direct impacts include placement of fill or removal of materials and vegetation; altered flow path or flow volume; and spills of contaminating materials. Potential indirect impacts include increased scour and erosion in downstream areas; changes in the rate and type of sediment deposition in downstream areas; and impacts such as impeded water flow and increased sediment deposition upstream of impacted areas. Direct and indirect impacts can produce secondary effects on biological resources and water quality when vegetation responds to impacts. Typical secondary impacts include loss of vegetation and wildlife habitat as soil moisture declines and erosion hazards increase. Table 3.6-4 provides estimated potential impacts to jurisdictional waters from the initial phase of wind park development, pending USACE determination (Atwell 2011). Data on potential impacts from subsequent phases will be acquired and reviewed by USACE when those phases are developed (Atwell 2011).

TABLE 3.6-4
POTENTIAL IMPACTS TO JURISDICTIONAL WATERS, INITIAL PHASE STUDY AREA

Location	Estimated Impacts (acres)
Access Road	0.1 – 0.3
Wind Park, Initial Phase Study Area	0.2 – 0.4
Transmission Tie-Line	0.1 – 0.3
Western Switchyard	No Impacts Anticipated

Source: Atwell 2011

Foresight would avoid or minimize potential impacts to jurisdictional washes, to the extent least environmentally damaging and most practicable, through implementation of the RPMs listed in Table 2.7-1. An additional RPM added to the Final EIS is based on a three-tiered approach to minimizing impacts. The tiered approach focuses on: 1) avoidance as the primary mechanism to limit impacts to jurisdictional waters; 2) where avoidance cannot be achieved, the reconfiguring of project infrastructure to minimize the quantity of jurisdictional waters impacted; and 3) the implementation of engineering controls to further limit impacts, where practicable. Design and engineering controls might include measures such as those listed below. Please note that any given measure may not be the most practicable measure for a given case or potential impact.

- Locating wind turbines and supporting construction pads outside of the limits of the jurisdictional waters;
- Aligning support access roads and utility infrastructure parallel to the identified jurisdictional waters to avoid perpendicular crossings, where feasible;
- Where crossings cannot be avoided, locating crossings to minimize adverse effects; using culverts to limit indirect and secondary impacts to upstream and downstream waters; placing energy dissipation structures downstream of crossings as appropriate to minimize scour and erosion;
- Spanning jurisdictional waters by arch culverts or bridge where feasible;
- Burying utilities below the grade of the watercourse to assure free flow of stormwater within its jurisdictional limits, where feasible; constructing temporary trenches across the washes to locate the utilities and back fill with original materials in the selected alignment;
- Where practicable, directional drilling to limit disturbance of the jurisdictional waters by boring the planned utility under the affected watercourse;
- Where utilities are constructed over jurisdictional waters, locating support poles outside their limits, where feasible; as lines are pulled into place, temporary spans may be constructed to limit pulling of disturbed soil and vegetation debris from the banks of the drainage feature.

The impact of the initial phase is expected to affect approximately one-half acre for the initial phase study area, subject to USACE determination (Atwell 2011). Preliminarily, a similar impact for the build-out phase(s) study area in anticipated, also subject to USACE determination (Atwell 2011). The above approaches were taken into consideration to reduce and avoid impacts based on the current level of design presented in the preliminary layout plan (Figure 2.2-3). It is anticipated that final micro-siting would further incorporate the applicable design features/approaches described in the list above, and other best management practices (Atwell 2011). In addition, the BMPs outlined by the Forest Service would minimize the potential for accelerated soil erosion and sediment transport and protect water quality downstream and within wetlands. Construction activities would also be implemented to limit direct impact to identified waters of the U.S.

Potential impacts to jurisdictional washes would be further minimized by adhering to regulations and permits governing storm water pollution prevention and sediment control such as a Construction General Permit through AZPDES and a Federal Section 404 permit. Foresight consulted with USACE in November 2010 and would pursue a Section 404 permit for the initial phase because it is a separate and complete project for purposes of a Section 404 permit. Mitigation could be provided as a provision of the Section 404 permit(s) issued by the USACE. As subsequent phases of development undergo final design, preliminary jurisdictional determinations would be prepared and separate Section 404 permits obtained. Foresight anticipates a similar range of potential impacts for the subsequent phase(s) if the project is built out to 500 MW (Atwell 2011). Implementation of the project RPMs and permits would ensure that potential impacts to surface water flows, drainage patterns, quantity and quality are less than significant during wind park and transmission tie-line construction, operation, and maintenance activities.

Western's proposed switchyard would not be constructed within waters of the U.S. or near a Forest Service-identified wetland. Western would ensure that surface water is protected from pollution caused by construction activities, and require its construction contractor to obtain the appropriate permits. Therefore, it would not degrade or eliminate any wetlands or waters of the U.S.

Alteration of Surface Drainage Patterns or Stream Channel Morphology

The majority of both temporary and permanent disturbances associated with the proposed wind park and transmission tie-line would be on land currently used for rangeland and agriculture with low representative slopes. The primary exception to this associated with the proposed tie-line as it extends up the slope of Anderson Mesa. Construction within the wind park study area and along the transmission tie-line would result in grading, excavation, and exposure of soil, some of which may occur within or adjacent to existing streams or drainages. As described in the RPMs in Section 2.7, Foresight would avoid, to the extent possible, placing temporary or permanent facilities in floodplains and washes and ensure that all construction activities minimize disturbance to drainage channels and stream banks. Construction methods would minimize erosion and would include installation of cross drains, placement of water barriers adjacent to roads, and the application of other BMPs. As a result, alteration of flow patterns is not anticipated and would be avoided wherever possible.

The site proposed for Western's switchyard is not within an area where substantial alteration of the surface drainage patterns would be required. All surface drainage would be designed to flow around the switchyard site and left in a condition to facilitate natural revegetation and prevent erosion.

Alteration of Flows Within a Flood Hazard Area

On-site or off-site flooding would not result from construction, operation, or maintenance of the proposed project components. Flood hazard zones have not been identified within or adjacent to the proposed project components. The final engineering design for the wind park and transmission tie-line would evaluate site conditions and use the RPMs listed in Section 2.7 associated with applicable permits to address potential flooding. As a result, construction and operation of the proposed wind park and transmission tie-line would not would impede or redirect flood flows, and applicable water resources significance thresholds would not be exceeded.

The proposed Western switchyard would not be located within a floodplain or an area prone to flooding.

3.6.2.3 Alternative Transmission Tie-line Corridor

The alternative transmission line alignment would result in similar impacts as described for the proposed transmission tie-line. No ground or surface water resources are site specific to the location of the alternative tie-line alignment.

3.6.2.4 No Action Alternative

Under the No Action Alternative, no groundwater would be pumped, maintaining groundwater and surface water quantity and quality similar to current condition. In addition, surface water conditions would not be affected. As a result, no impacts to ground or surface water would be expected.

3.7 SOCIOECONOMICS

3.7.1 Affected Environment

3.7.1.1 Resource Evaluation Area

The socioeconomic analysis focused on an evaluation area that included Coconino and Navajo counties, including the cities of Flagstaff and Winslow. The socioeconomic evaluation area was defined by the regional transportation network and the available labor force within a reasonable distance of the proposed project components. Both distance and geographic features were taken into consideration when determining which communities were to be included in this analysis.

3.7.1.2 Characterization

This section describes existing conditions associated with the economy of the socioeconomic evaluation area including population, economic base, employment, income, housing, and public services.

Population

Population within the socioeconomic evaluation area has grown substantially over the past 20 years. A summary of current and historic population is included as Table 3.7-1.

TABLE 3.7-1
POPULATION TRENDS

Location	Population			Percent Change 1990 to 2008
	1990	2000	2008	
Arizona	3,665,228	5,130,632	6,629,455	80.9
Coconino County	96,591	116,321	135,614	40.4
Navajo County	77,658	97,470	114,780	47.8
City of Flagstaff	45,857	52,894	64,693	41.1
City of Winslow	8,190	9,520	10,194	24.5

Sources: Arizona Department of Commerce 2009a, 2009b, 2009c, and 2009d

Economic Base, Employment, and Income

The economies of both Coconino and Navajo counties are based largely on educational services, and health care and social assistance. These industries account for approximately one-quarter of the work force in both counties. The construction trade employs 9.6 percent of the work force in Coconino County and 14.5 percent in Navajo County, accounting for approximately 12,194 total jobs (U.S. Census Bureau 2008b and 2008f).

The average annual labor force, including unemployment, for the socioeconomic evaluation area is summarized in Table 3.7-2.

TABLE 3.7-2
LABOR FORCE, 2006–2008

Industry	Coconino County	Navajo County	City of Flagstaff	City of Winslow
EMPLOYED				
Agriculture/Forestry/Fishing and Hunting/Mining	789	1,174	384	20
Construction	6,196	5,938	2,894	197
Manufacturing	4,339	1,441	2,977	71
Wholesale Trade	1,107	714	480	29
Retail Trade	8,029	5,269	4,832	449
Transportation and Warehousing/Utilities	3,614	2,480	1,199	361
Information	704	475	488	18
Finance and Insurance/Real Estate/Rental and Leasing	2,592	1,554	1,718	107
Professional/Scientific/Management and Administrative/Waste Management Services	3,366	1,598	1,680	95
Educational Services/Health Care and Social Assistance	16,623	9,787	9,913	752
Arts and Entertainment/Recreation/ Accommodation/Food Services	9,568	4,692	5,737	402
Public Administration	4,221	3,942	1,657	507
Other Services	3,150	1,934	1,583	151
UNEMPLOYED	3,329	4,910	1,414	196
TOTAL LABOR FORCE	**67,690**	**45,967**	**37,019**	**3,355**

Sources: U.S. Census Bureau 2000b, 2008b, 2008d, and 2008f

The median household income for Coconino and Navajo counties is $49,611 and $39,678, respectively. The median household income for the City of Flagstaff is $49,885, nearly identical to Coconino County as a whole. The median household income for the City of Winslow is $29,741, substantially lower than the median for Navajo County (U.S. Census Bureau 2000b, 2008b, 2008d, and 2008f).

Currently, the primary source of revenue or employment within the wind park study area is cattle ranching. In 2005, Coconino County amended the Coconino County Comprehensive Plan to include the Diablo Canyon RPA. The Diablo Canyon RPA was developed with a primary objective to maintain historic ranching operations while identifying economic opportunities that would supplement ranching incomes and provide a way to offset the costs of range improvements. The plan specifically identifies five economic activities that would achieve the primary objective, including: 1) value added beef; 2) tourism, recreation, and education; 3) wood products; 4) energy development; and 5) housing.

Housing Market and Property Values

There are over 100,000 housing units in Coconino and Navajo counties. Of these, more than 30,000 are classified as vacant. This number includes vacation homes, popular in Arizona's high country, which are seasonally occupied. A more accurate characterization of available housing is vacancy rates. These rates along with other selected housing data for the evaluation area are summarized in Table 3.7-3.

TABLE 3.7-3
HOUSING DATA, 2006–2008

Description	Coconino County	Navajo County	City of Flagstaff	City of Winslow
Owner occupied housing units	27,620	24,725	11,952	1,505
Renter occupied housing units	15,716	9,115	10,908	995
Vacant housing units	15,433	18,548	3,302	451
Homeowner vacancy rate	3.1 %	2.7 %	3.9 %	n/a
Rental vacancy rate	4.9 %	4.1 %	4.8 %	n/a
Median house value	$284,600	$130,800	$331,100	$61,900
Median gross rent/month	$868	$606	$937	$428

Sources: U.S. Census Bureau 2000a, 2008a, 2008c, and 2008e

Public Services and Facilities

Organizing and providing services to a geographically dispersed citizenry is a challenge for rural jurisdictions such as Coconino and Navajo counties. The wind park study area is located within an area with very few residences, and community services are limited. Public services and institutions within the evaluation area are described below:

Schools and Libraries

Two school districts are located within the socioeconomic evaluation area, Flagstaff Unified School District (USD) and Winslow USD No. 1. The Flagstaff USD operates three high schools, four middle schools, nine elementary schools, and four magnet schools. The Winslow USD No. 1 includes one high school, one middle school, and three elementary schools.

Coconino and Navajo counties operate community libraries in the cities of Flagstaff and Winslow, respectively.

Law Enforcement

Law enforcement is provided to unincorporated portions of the socioeconomic evaluation area through the Coconino County Sheriff's Department and the Navajo County Sheriff's Department. The proposed project components would be served by the Coconino County Sheriff's Department, and the nearest Sheriff's Office is located in Flagstaff.

Fire Protection

Multiple fire departments are located throughout the socioeconomic evaluation area in both Coconino and Navajo counties. The proposed project components would be served by the Mormon Lake Fire District, located along the south end of Mormon Lake, near Lake Mary Road. Additional service could be provided, as needed, by the Summit Fire District on Koch Field Road east of Flagstaff and the Arizona State Land Department Fire District on Lake Mary Road in Flagstaff.

Health and Social Services

Two hospitals are located within the socioeconomic evaluation area, Flagstaff Medical Center and Winslow Memorial Hospital. The Flagstaff Medical Center has 270 inpatient beds and 200 physicians on active medical staff. The Winslow Memorial Hospital is smaller and includes 34 inpatient beds.

Water, Wastewater, and Solid Waste

Centralized water and wastewater service is provided by the cities of Flagstaff and Winslow. Unincorporated areas of Coconino and Navajo counties obtain water from private wells and dispose of wastewater through private septic systems. The nearest landfill is the Cinder Lake Landfill, more than 25 miles from proposed wind park, operated by the City of Flagstaff.

3.7.2 Environmental Consequences

This section evaluates the potential impact of the proposed wind park, proposed transmission tie-line, and Western's proposed switchyard on the socioeconomic environment. Overall, the proposed project components would have a beneficial impact on the economies of Coconino and Navajo counties. The proposed wind park would improve local employment and business activity and contribute to local tax revenue.

3.7.2.1 Standards of Significance

Impacts to socioeconomics would be considered significant if any of the following conditions occur:

- Induce population growth that would strain government and community facilities and services from the in-migration of the proposed workforces.
- Result in insufficient existing housing in the evaluation area to meet the needs of in-migrating workers and their families.
- Create the need for a major new utility system, or substantially alter an existing utility system, including power or natural gas, communications systems, water, sewer, or solid waste disposal.

3.7.2.2 Foresight's Proposed Project and Proposed Federal Actions

Construction of the proposed wind park would require approximately 400 temporary workers at peak construction activity for each phase, and each phase would last between 12 and 18 months. Following construction, it is anticipated that 17 to 40 permanent employees would conduct operations and maintenance of the wind park, if fully built out to 500 MW.

Contracts for the construction of the proposed wind park and transmission tie-line would be part of a competitive bidding process for each phase. Local workers and construction firms would have the opportunity to apply for or bid on many of these jobs. It is anticipated that substantial employment efforts would flow through local construction and service firms that successfully obtain contracts through the construction bidding process. Western would issue a separate solicitation for the construction of the proposed switchyard in accordance with Western's contracting requirements.

Particularly during the construction phase, construction employment and activities would benefit the local economy. Personal income from employment would increase local spending through purchases of consumer goods and services, lodging, transportation, and utilities. Local businesses providing construction materials and services, equipment repair, and maintenance services would likely experience increased revenues from each of the proposed project components' construction budget. These direct expenditures would generate additional jobs and revenue at the local, city, and county levels. Due to the availability of construction workers and existing construction and service firms in the socioeconomic

evaluation area and the relatively short duration of the construction, construction-related expenditures would not induce population growth that would strain government and community facilities and services from the in-migration of the construction workforce. Once construction is finished, operations would require annual expenditures and payroll that, when spent, would generate additional personal income and employment. In addition, the proposed wind park would supplement the incomes of ranchers currently using the area to raise cattle. Energy development, specifically energy from wind resources, was identified by the Diablo Canyon RPA as a compatible economic pursuit that would meet the plan's primary objective to maintain traditional ranching operations. The wind park would provide new revenues to the ASLD from the lease of State trust lands, optimizing economic return for the trust beneficiaries.

Sufficient existing housing is available within commuting distance of the proposed project components to meet the needs of in-migrating construction workers and their families, as well as permanent workers and their families. More than 30,000 housing units are currently vacant within Coconino and Navajo counties.

The majority of jobs created by the proposed wind park are expected to be temporary. Between 17 and 40 permanent employees would be hired to operate and maintain the proposed wind park if fully built-out to 500 MW, at least some of whom would be hired from the local labor force. This would lead to a slightly greater demand on public facilities, including schools, which would likely be spread across several jurisdictions. However, vacancy rates in housing units suggest capacity is available.

None of the proposed project components, including the O&M facility proposed as part of the wind park, would use public water and sewage systems. Rather, potable water would be supplied from an on-site well or hauled in periodically by a commercial water hauler. In addition, sewage would be disposed of on-site through a septic system that would be installed. The proposed wind park would not directly require the use of public facilities, nor would it substantially induce growth that would increase the demand on public facilities and services or infrastructure. Thus, there would not be a need to install or alter a major new utility system and significance thresholds would not be exceeded.

3.7.2.3 Alternative Transmission Tie-line Corridor

The alternative transmission tie-line would not alter potential impacts, including beneficial impacts, to socioeconomic resources from those discussed under the proposed transmission tie-line.

3.7.2.4 No Action Alternative

Under the No Action Alternative, Western would not approve an interconnection for the Grapevine Canyon Wind Project and the Forest Service would not issue a permit for the transmission tie-line proposed for the wind park. The proposed wind park, transmission tie-line, and switchyard would not be constructed and the beneficial socioeconomic impacts associated with the construction, operations, and maintenance of the wind park would not occur. In addition, the economic objectives of the Diablo Canyon RPA would not be realized as quickly, since no other similar economic development proposals for this area are currently under consideration.

3.8 ENVIRONMENTAL JUSTICE

3.8.1 Affected Environment

3.8.1.1 Resource Evaluation Area

The environmental justice analysis focused on an evaluation area identical to socioeconomics which included Coconino and Navajo counties. For purposes of this analysis, the affected population is considered to be residents of these two counties.

3.8.1.2 Characterization

EO 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations) requires that projects and proposals be examined to ensure that negative effects are not disproportionately distributed on at-risk populations including low-income, minority, and elderly.

The wind park study area is located on private and State trust lands with no permanent residences. A few rural ranching residences are located in proximity to the wind park study area, but very few other residences are located within several miles.

The Hopi Hart Ranch, north of the wind park study area, and the Clear Creek Ranch, east of the wind park study area, were conveyed from fee simple land held by the Hopi Tribe to the U.S. in Trust for the Hopi Tribe in December 2008. The Navajo Nation is located more than ten miles north of the proposed wind park.

The proposed transmission tie-line, alternative transmission tie-line, and Western's proposed switchyard are located on Federal lands under the jurisdiction of the Forest Service. Forest Service-managed lands are managed for multiple uses and are open to the public. Forest Service-managed lands in the vicinity of the proposed transmission tie-line and switchyard generally are leased for grazing; used for dispersed recreation, including hiking, camping, and wildlife viewing; hunting; and gathering firewood.

The population of Coconino and Navajo counties is more racially diverse than the State of Arizona as a whole. In particular, a large Native American population resides within these two counties. In addition, low-income populations are slightly more prevalent within these two counties than the State of Arizona as a whole. Data on minority and low-income populations throughout Coconino and Navajo counties and the cities of Flagstaff and Winslow are summarized in Table 3.8-1. Data for the State of Arizona are provided for context.

TABLE 3.8-1
MINORITY AND LOW-INCOME CHARACTERISTICS OF
ENVIRONMENTAL JUSTICE EVALUATION AREA, 2006–2008

Race or Ethnicity	Arizona		Coconino Co.		Navajo Co.		Flagstaff		Winslow	
	Persons	%	Persons	%	Persons	%	Persons	%	Persons	%
White	4,928,000	78	78,675	62	50,204	45	46,860	74	5,004	52
Black	224,000	4	1,549	1	1,261	1	1,205	2	493	5
Native American	285,000	5	35,954	28	50,536	46	8,352	13	2,234	23
Asian	150,000	2	1,650	1	323	0.3	1,163	2	98	1
Other	558,000	9	6,548	5	5,196	5	4,390	7	1,284	13

TABLE 3.8-1
MINORITY AND LOW-INCOME CHARACTERISTICS OF
ENVIRONMENTAL JUSTICE EVALUATION AREA, 2006–2008

Race or Ethnicity	Arizona		Coconino Co.		Navajo Co.		Flagstaff		Winslow	
	Persons	%	Persons	%	Persons	%	Persons	%	Persons	%
Hispanic/Latino (of any race)	1,877,000	30	15,454	12	10,865	10	11,001	17	2,746	29
Individuals Below Poverty Level	907,200	14	20,748	16	24,847	22	9,780	15	1,990	20.9

Sources: U.S. Census Bureau 2000a, 2000b, 2008a, 2008b, 2008c, 2008d, 2008e, 2008f, and 2008g

3.8.2 Environmental Consequences

The assessment of environmental justice evaluates the impacts to the human environment associated with the proposed project components in context with minority, low-income, and Native American populations within the environmental justice evaluation area. The following definitions are excerpted from EO 12898:

Disproportionately high and adverse human health effects: When determining whether human health effects are disproportionately high and adverse, agencies are to consider the following three factors to the extent practicable:

a) Whether the health effects, which could be measured in risks and rates, are significant (as employed by NEPA), or above generally accepted norms. Adverse health effects could include bodily impairment, infirmity, illness, or death.
b) Whether the risk or rate of hazard exposure by a minority population, low-income population, or Indian tribe to an environmental hazard is significant (as employed by NEPA) and appreciably exceeds or is likely to appreciably exceed the risk or rate to the general population or other appropriate comparison group.
c) Whether health effects occur in a minority population, low-income population, or Indian tribe affected by cumulative or multiple adverse exposures from environmental hazards.

Disproportionately high and adverse environmental effects: When determining whether environmental effects are disproportionately high and adverse, agencies are to consider the following three factors to the extent practicable:

a) Whether there is or would be an impact on the natural or physical environment that significantly (as employed by NEPA) and adversely affects a minority population, low-income population, or Indian tribe. Such effects could include ecological, cultural, human health, economic, or social impacts on minority communities, low-income communities, or Indian tribes when those impacts are interrelated to impacts on the natural or physical environment.
b) Whether environmental effects are significant (as employed by NEPA) and are or could be having an adverse impact on minority populations, low income populations, or Indian tribes that appreciably exceeds or is likely to appreciably exceed those on the general population or other appropriate comparison group.
c) Whether the environmental effects occur or would occur in a minority population, low income population, or Indian tribe affected by cumulative or multiple adverse exposures from environmental hazards.

3.8.2.1 Standards of Significance

Impacts would be considered significant if the following were to occur as a result of the proposed project:

- Disproportionately affect a minority, Native American, or low-income subsistence populations.

3.8.2.2 Foresight's Proposed Project and Proposed Federal Actions

There is no resident population (low-income, minority, Native American, or otherwise) that would be directly affected by construction and operation of the proposed wind park, proposed transmission tie-line, or Western's proposed switchyard.

Forest Service-managed lands in the vicinity, open to the public, are not known to be used in disproportion by Native American, minority, or low-income populations. Therefore, impacts, as a result of the proposed transmission tie-line and Western's proposed switchyard, to activities occurring on this portion of the Forest are expected to be very low.

Within the two-county region, the Navajo Nation is located more than ten miles to the north of the proposed wind park, the Hopi Tribe Trust lands and the Hopi Reservation are north and east of the proposed wind park, and the nearest population centers, Flagstaff and Winslow, are located more than 20 miles from the proposed wind park. The proposed wind park, proposed transmission tie-line, and Western's proposed switchyard would not create disproportionately negative impacts on the Navajo Nation, the Hopi Tribe, or on low-income or minority groups. Moreover, the regional socioeconomic impact of the proposed wind park is beneficial in that it would create employment opportunities, economic multiplier effects, and tax revenue that would indirectly, and possibly directly, benefit persons living below the Federal poverty level within the environmental justice evaluation area.

3.8.2.3 Alternative Transmission Tie-line Corridor

Impacts to minority, Native American, and low-income subsistence populations would not differ from those associated with the proposed transmission tie-line if the alternative transmission tie-line were to be constructed and operated.

3.8.2.4 No Action Alternative

If the proposed wind park were not constructed, impacts associated with employment opportunities and tax revenue would not benefit persons living below the Federal poverty level within the environmental justice evaluation area.

3.9 TRANSPORTATION

3.9.1 Affected Environment

3.9.1.1 Resource Evaluation Area

The transportation resource evaluation area for transportation includes an area within one mile of the wind park study area, proposed transmission tie-line, and Western's proposed switchyard. In addition, the primary access routes that would be used for employees accessing the project components and for the delivery of equipment and materials are part of the transportation evaluation area. These include the I-40/Meteor Crater interchange, Meteor Crater Road, and Lake Mary Road near its intersection with FS 125. These primary access routes were determined to be the areas where the potential hazard or risk, including traffic concerns, would be the greatest.

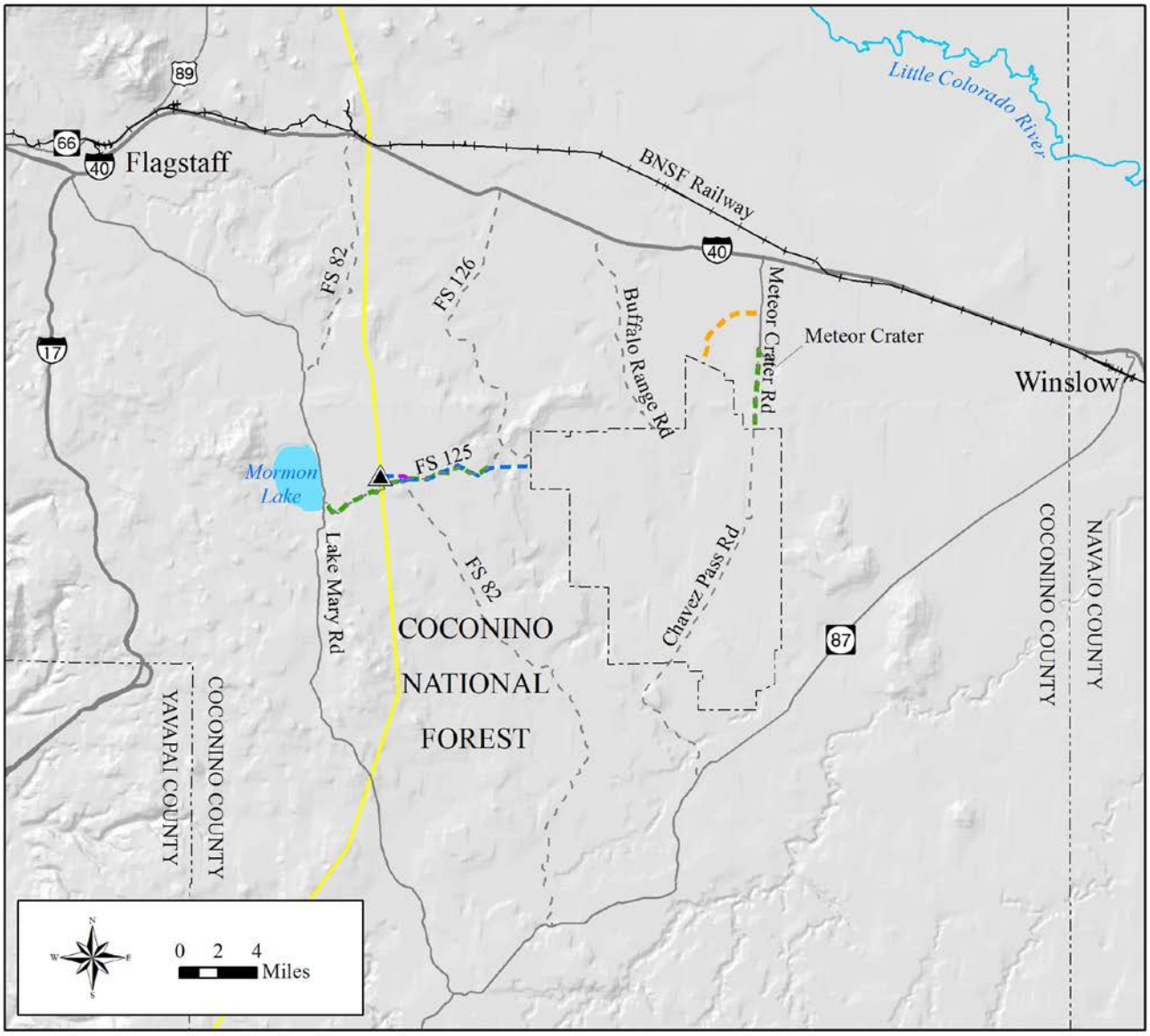
Data was gathered through field verification and the review of various documents and maps. Sources of information include published land use plans and reports including the Coconino County Comprehensive Plan, the Diablo Canyon RPA, the Forest Plan, and various reports available from the Arizona Department of Transportation (ADOT). In addition, contacts were made with jurisdictional and agency personnel and websites were accessed for information. Information on aircraft use within the evaluation area was also collected.

3.9.1.2 Characterization

Ground transportation features are considered to be substantial roads and highways, such as interstate highways, State highways, county and other major roads, and railroads. Interstate or State highways include all dedicated Federal or State highway routes maintained by ADOT. County roads include all major roads maintained by Coconino County that represent major interconnections between interstate, Federal, or State highways with major access routes in rural areas. Regularly maintained and non-maintained Forest Service System roads and roads that cross State trust lands also are present within the transportation evaluation area. The roads are depicted below in Figure 3.9-1. Table 3.9-1 lists existing roads within or adjacent to the transportation evaluation area.

Surface transportation features within and adjacent to the transportation evaluation area include Federal and county jurisdictional roads. I-40 is the principal arterial within the transportation evaluation area and is under the jurisdiction of the ADOT. Lake Mary Road is a major road which provides local access to Flagstaff, as well as to Lake Mary and Mormon Lake, among many other recreation areas on National Forest System lands. FS 125 and FS 126 (Twins Arrows Road) provide access to National Forest System lands, and FS 125 and FS 82 provide access to Kinnikinick Lake and other recreation areas.

Meteor Crater Road is a paved road that extends from I-40 to Meteor Crater. Buffalo Range Road (which does not connect to the wind park study area) and Chavez Pass Road are both considered primitive local roads and are not maintained regularly by the county. Signage on these roads warns vehicle operators that they are taking a risk driving on the roadways. Other roads within the transportation evaluation area include dirt ranch roads and jeep trails allowing access to rural development in the area, low-maintenance roads across State trust lands and National Forest System lands, and illegal/non-system roads created by recreation users with all-terrain vehicles (ATVs) and other off-highway vehicles (OHVs).


Little Colorado River
89
66
40
Flagstaff
BNSF Railway
40
FS 82
FS 126
Buffalo Range Rd
Meteor Crater Rd
Meteor Crater
Winslow
17
Mormon Lake
FS 125
Lake Mary Rd
FS 82
COCONINO NATIONAL FOREST
Chavez Pass Rd
87
COCONINO COUNTY
NAVAJO COUNTY
YAVAPAI COUNTY
COCONINO COUNTY
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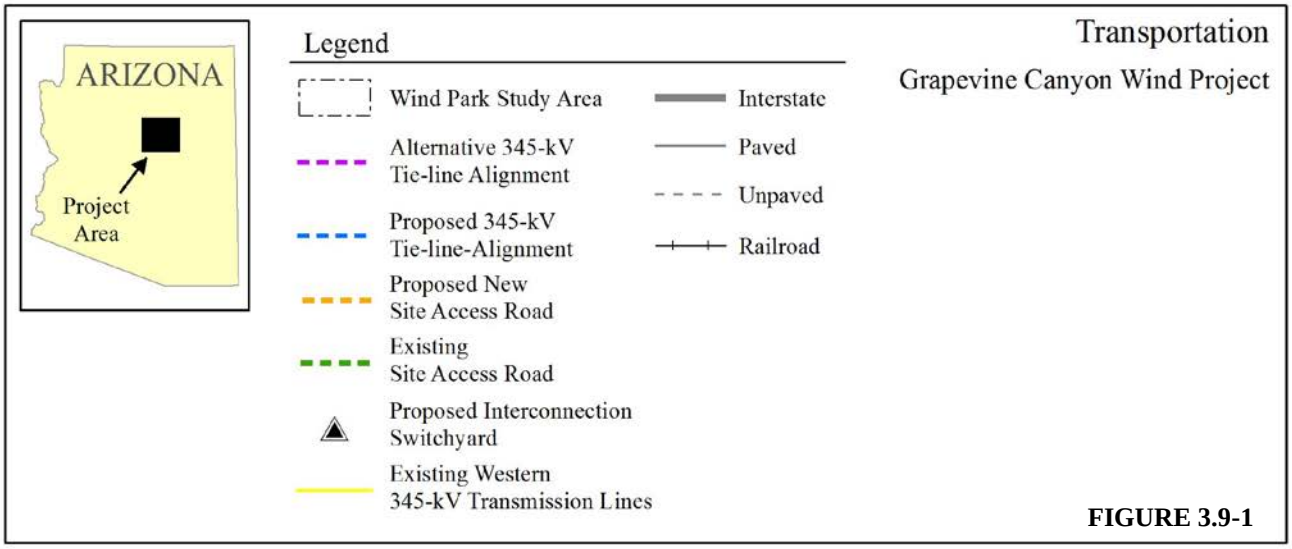

ARIZONA
Project Area
Legend
Wind Park Study Area
Alternative 345-kV Tie-line Alignment
Proposed 345-kV Tie-line-Alignment
Proposed New Site Access Road
Existing Site Access Road
Proposed Interconnection Switchyard
Existing Western 345-kV Transmission Lines
Interstate
Paved
Unpaved
Railroad
Transportation
Grapevine Canyon Wind Project

FIGURE 3.9-1

TABLE 3.9-1
SUMMARY OF ROADS WITHIN THE TRANSPORTATION EVALUATION AREA

Roads	Surface	Jurisdiction
NORTH-SOUTH ROADS		
State Route (SR) 87	Paved (asphalt)	ADOT
Lake Mary Road (Forest Hwy 3)	Paved (asphalt)	Forest Service/Coconino County/Flagstaff
FS 126 (Twin Arrows Road)	Unpaved (dirt)	Forest Service/Coconino County
Buffalo Range Road	Unpaved (dirt)	Coconino County
Meteor Crater Road	Paved (asphalt)	Coconino County
Chavez Pass Road	Unpaved (dirt)	Coconino County
FS 82	Unpaved (dirt)	Forest Service
EAST-WEST ROADS		
I-40	Paved (asphalt)	Federal Highway Administration/ADOT
FS 125	Paved (gravel)/unpaved (dirt)	Forest Service

Traffic volumes for the roadways located within the transportation evaluation area are shown below in Table 3.9-2. The majority of motor vehicle traffic is limited to local commuters, ranchers, recreationists, and tourists.

TABLE 3.9-2
TRAFFIC VOLUME ON HIGHWAYS AND ROADS IN TRANSPORTATION EVALUATION AREA

Route	Start	End	Length (miles)	AADT[1]	POS[2]	NEG[3]
I-40	Exit 211 Winona Rd	Exit 219 FS 126 (Twin Arrows Rd)	8.41	14,676	6,802	7,872
I-40	Exit 219 FS 126 (Twin Arrows Rd)	Exit 225 Buffalo Range Rd	5.47	16,600	7,763	8,930
I-40	Exit 225 Buffalo Range Rd	Exit 230 Canyon Diablo Road/ Two Guns	5.41	16,002	7,783	8,217
I-40	Exit 230 Canyon Diablo Rd/ Two Guns	Exit 233 Meteor Crater Rd	3.42	15,340	7,167	8,175
I-40	Exit 233 Meteor Crater Rd	Exit 239 Dennison Rd/ Meteor City Rd	5.78	16,089	n/a	n/a
Lake Mary Rd*	South of Upper Lake Mary	—	n/a	1,239	n/a	n/a
SR 87	Lake Mary Rd	SR 99	50.31	700	n/a	n/a
Meteor Crater Rd	I-40	End/Chavez Pass Rd	n/a	830	n/a	n/a
Chavez Pass Rd	Meteor Crater Rd	SR 87	n/a	21	n/a	n/a

[1] AADT – Annual Average Daily Traffic volume estimate (bi-directional)
[2] POS – Annual Average Daily Traffic volume estimate, increasing highway milepost numbers
[3] NEG – Annual Average Daily Traffic volume estimate, decreasing highway milepost numbers
n/a – data not available

Source: ADOT 2009; Coconino County Public Works Department. * From: Traffic Resource and Analysis, Inc., taken July 2007.

Generally traffic is free flowing on both County and ADOT maintained roads and there are no major traffic congestion concerns within the transportation evaluation area.

Cross-country travel of motorized vehicles are currently allowed on Forest Service-managed lands for recreational activities, such as sightseeing, camping, hiking, hunting, and fishing. Motorized travel is permitted, except in areas that are signed as closed or restricted to seasonal use. On May 1, 2012 the Coconino National Forest is implementing new travel management rules that will restrict the large majority of motor vehicle use to designated roads, trails, and areas on Forest Service-managed lands. This will have the result of restricting all off-road travel except in designated areas and in those situations where motor vehicle use is exempt from the rule (i.e., when authorized under Federal permit or in emergencies). These new rules allow motorized use on over 3,000 miles of existing roads and trails (including Forest Road 125) and include over 600 miles of roads with dispersed camping corridors where one may drive off the road up to 300 feet for the purpose of car camping. The effect of this change is to restrict off-road travel and close almost 1,000 miles of drivable roads in areas with the most sensitive wildlife, watershed, archeological, or scenic areas. The Forest expects to focus on implementation through education for the first year. Other forests throughout the nation that have implemented similar changes have found they take approximately a decade to reach full implementation.

The Burlington Northern Santa Fe Railway provides regional rail freight service. The railway is located approximately ten miles north of the wind park study area, traveling in an east-west direction mostly parallel to I-40 (Pearsell 2002).

No regional or municipal airports are in the immediate vicinity of the transportation evaluation area; however, the AGFD conducts wildlife surveys in the area using low-flying aircraft. The closest airports are in Flagstaff and Winslow, both of which are approximately 25 miles from the wind park study area.

Western uses a helicopter to patrol the existing 345-kV transmission lines. The lines are patrolled quarterly to look for damaged transmission tie-line insulators and other transmission structure maintenance needs. Western's helicopter flies at low levels over the transmission tie-line rights-of-way.

3.9.2 Environmental Consequences

3.9.2.1 Standards of Significance

Implementation of the proposed wind park, transmission tie-line, and Western's proposed switchyard would have a significant and adverse effect on transportation if it would:

- Result in the permanent disruption of regional or local vehicle traffic.
- Result in the destruction of existing road or railroad infrastructure.
- Encroach upon an FAA-designated air safety zone around an existing airport or create an air safety hazard.

3.9.2.2 Foresight's Proposed Project and Proposed Federal Actions

Construction

Project construction activities would temporarily increase traffic volume on roadways within the transportation evaluation area as a result of both commuting construction workers and the transportation of equipment and materials.

Heavy equipment, construction materials and supplies, and labor required for the proposed project components would access the site from I-40 at Meteor Crater Road or Lake Mary Road. From these roads, there are three potential site access routes into the project area. The primary point of access for the

proposed wind park and for the eastern-most portion of the transmission tie-line would be along a newly constructed access road extending from Meteor Crater Road for approximately 8.5 miles into the proposed wind park. The second, an existing access road to the proposed wind park for future phases would utilize Chavez Pass Road, located just south of Meteor Crater Road. This road extends into the wind park study area and is expected to require no improvements outside of the existing right-of-way. Access to the western-most portion of the proposed transmission tie-line and Western's proposed switchyard would occur from Lake Mary Road along existing FS 125. This road could need improvement with the existing roadway near Lake Mary Road.

It is anticipated that several types of light, medium, and heavy-duty construction vehicles would travel to and from the project area, as well as private vehicles used by construction personnel. Overweight and/or oversized loads associated with the delivery of construction equipment, WTG components, transmission tie-line structures, and switchyard equipment would be via semi-truck trailers. If one crane capable of erecting the WTG towers and attaching the blades is on-site, about 10 to 13 semi-truck loads could be transported to the wind park site per equipment delivery day for the duration of construction. If two cranes are on-site, 20 to 26 semi-truck loads could be transported and unloaded within the wind park study area per equipment delivery day over a 12 to 18 month construction period per project phase. Construction traffic associated with the proposed transmission tie-line and switchyard would be approximately ten trucks per day, occurring over a period of six to ten months.

The number of anticipated passenger vehicle trips per day that would occur during construction would vary depending on the construction stage and the number of carpool vehicles. It is anticipated that the majority of the workforce for construction would travel to the site from Flagstaff, Winslow, and nearby cities and towns within a 50-mile radius. For the wind park construction, the worst case scenario is where all workers commute in vehicles with only one occupant, yielding a peak trip generation of approximately 400 inbound trips during the morning peak period and another 400 outbound trips during the evening peak hour for peak construction activity periods for the proposed wind park. Construction and associated traffic is expected to occur over a period of 12 to 18 months. Worker traffic associated with the transmission tie-line and switchyard construction is expected to be approximately 25 vehicles per day, occurring over a period of six to ten months.

The movement of equipment, materials, and workers during construction would cause a short-term increase in the level of service of local roadways. Equipment, materials, and workers transport to the proposed wind park would not be expected to cause a substantial disruption to traffic or to level of service along I-40, but overweight and/or oversized loads could result in temporary road closures or detours and traffic delays at the I-40/Meteor Crater Road interchange and along Meteor Crater Road during transport of large construction equipment and WTG components. These disruptions would be expected to occur during the peak construction periods when delivery of equipment and construction for the foundation and tower assembly would take place. The vast majority of traffic along Meteor Crater Road is associated with visitation to Meteor Crater. This site attracts approximately 230,000 visitors a year, which correlates to an average of about 315 vehicles per day (Arizona Office of Tourism 2007). In addition, small amounts of other local traffic use the road to access private land in the vicinity or to travel along Chavez Pass Road to access State Route (SR) 87. The limited amount of traffic utilizing the I-40/Meteor Crater Road interchange and Meteor Crater Road, combined with Foresight's commitment to develop a traffic control plan for the interchange and road, would not result in permanent traffic disruptions or safety concerns at the I-40/Meteor Crater interchange and Meteor Crater Road.

Increased traffic impacts for the proposed transmission tie-line and Western's proposed switchyard would occur near the Lake Mary Road/FS 125 intersection. Some restriction or temporary closure of FS 125 could also occur during the delivery of equipment and materials to the proposed transmission tie-line right-of-way or to the proposed switchyard site. These would be intermittent and temporary and would

only occur for a portion of the expected 12 to 18 month construction period. Construction traffic would be limited and occur at the beginning and the end of the day.

Construction traffic associated with proposed wind park, transmission tie-line, and Western's proposed switchyard would not result in the permanent disruption of regional and local traffic and thereby would not have a significant impact.

Shipments of overweight and/or oversized loads might require fortification of culverts and temporary removal of obstructions to accommodate overweight or oversized shipments. The need for such actions would be determined on a site-specific basis. In the event a road is damaged during construction of the proposed project components, the roadway would be repaired to pre-construction conditions as detailed in Section 2.7, resulting in a minimal, but temporary, impact. Applicable significance thresholds to transportation would not be exceeded.

The proposed wind park, transmission tie-line, and Western's proposed switchyard are not expected to use rail for the transport of project-related equipment. Furthermore, the Burlington Northern Santa Fe Railroad tracks would not be crossed by construction or passenger vehicles.

Operation and Maintenance

Traffic associated with operation of the proposed wind park is expected to be minimal. During operations, the wind park is expected to be attended by a small maintenance and operation crew. Consequently, transportation activities would be limited to a small number of daily trips by pickup trucks, medium-duty vehicles, or personal vehicles. It is possible that large components could be required for equipment replacement in the event of a major mechanical repair. However, such shipments would be expected to be infrequent.

Traffic associated with the operation of the proposed transmission tie-line and Western's proposed switchyard would be more limited. Maintenance crews would occasionally drive the transmission tie-line access roads to inspect the transmission tie-line. Western's proposed switchyard would be visited periodically by Western's maintenance personnel to conduct inspections and test equipment. Access to the transmission tie-line and/or switchyard by heavy equipment could be required on occasion if repairs are needed.

Thus, operation and maintenance of the proposed wind park, transmission tie-line, and Western's proposed switchyard would not result in a permanent disruption of regional or local vehicle traffic and would not exceed significance thresholds listed in Section 3.9.2.1.

No regional or municipal airports are in the transportation evaluation area. The closest airports are located approximately 25 miles from the wind park study area in both Flagstaff and Winslow. As a result, the proposed project components would not impact an FAA-designated air safety zone around an existing airport.

The FAA regulates obstructions to navigable airspace (14 CFR 77, or FAA Part 77). Foresight is required to notify the FAA Administrator of any proposed construction "of facilities more than 200 feet in height above the ground level at its site" (Section 77.13[a][1]). The height of towers and length of blades proposed for the wind park have a combined height of approximately 424 feet, exceeding the FAA notice threshold. Foresight would coordinate with the FAA and meet requirements for lighting as outlined in the RPMs (Section 2.7). Thus, the proposed towers would not create an air hazard.

The AGFD's use of low-flying aircraft in the area is needed to conduct wildlife surveys; however, such use creates the potential for dangerous incidents to occur between towers, turbines, transmission lines, and aircraft. The proposed wind park and transmission tie-line would comply with the recommendations for tower and turbine construction and safety to aircraft pilots, as outlined in the AGFD's *Guidelines to Reducing Impact to Wildlife from Wind Energy Development in Arizona*. Adherence to these guidelines, in addition to the required FAA lighting, would help to keep pilots and personnel safe and eliminate any air hazards with towers, turbines, and associated transmission lines. The construction, operation, and maintenance of the proposed project components would, therefore, not create an air hazard, and significance thresholds applicable to aviation would not be exceeded.

3.9.2.3 Alternative Transmission Tie-line Corridor

Transportation impacts associated with construction and operation of the alternative transmission tie-line would generally be the same as those described for the proposed transmission tie-line. The alternative transmission tie-line would require the construction of a new access road over a distance of approximately three-quarter mile. This new access road could lead to an increase in off-road vehicular traffic on this particular portion of Forest Service-managed lands and could require that new access roads are signed closed if illegal use becomes an issue.

3.9.2.4 No Action Alternative

Under the No Action Alternative, transportation would not be affected. Under this alternative, Western would not approve an interconnection for the Grapevine Canyon Wind Project and the Forest Service would not issue a permit for the transmission tie-line proposed for the wind park. The wind park, transmission tie-line, and switchyard would not be constructed and transportation would remain unchanged.

3.10 HEALTH, SAFETY, AND SECURITY

3.10.1 Affected Environment

3.10.1.1 Resource Evaluation Area

The resource evaluation area for health, safety, and security includes the wind park study area, transmission tie-line, Western's switchyard, and an area within one mile of each of these project components. In addition, primary access routes are included as part of this evaluation area. These include the I-40/Meteor Crater interchange, Meteor Crater Road, and Lake Mary Road near its intersection with FS 125. These areas were determined to be the areas where the potential hazard or risk, including traffic concerns, would be the greatest.

3.10.1.2 Characterization

The health, safety, and security resource evaluation area is rural in nature with low population density. One residence associated with the Flying M Ranch Winter headquarters is located immediately to the west of the wind park study area. The predominant activities are ranching and dispersed recreation.

This section describes the existing health, safety, and security issues in the resource evaluation area. These include potential risks associated with wildfire and high-voltage transmission lines. Existing conditions related to vehicular traffic and aviation are discussed under the transportation section.

Wildfire Hazard

Fire risks are present in the health, safety, and security evaluation area, especially near the proposed transmission tie-line and Western's proposed switchyard located on Forest Service-managed lands. No fires have occurred in the vicinity of the proposed transmission tie-line or switchyard in recent history, but because the resource evaluation area around the proposed facilities is generally arid rangeland with a predominant groundcover of grasses, cacti, small shrubs, and trees the greatest risk of fire would be during the hot, dry Summer season. Once started, a range fire could spread rapidly. The rate, extent, and direction of spread would be dependent on the location of the fire, available fuel, temperature, wind speed and direction, presence or absence of fire breaks, and response time and capability of emergency responders. Fire safety and emergency response services are provided by local emergency response agencies. Although these services are available in incorporated areas within the County, they are not universally available in rural unincorporated areas (Coconino County 2003). The nearest serving emergency response teams are the Mormon Lake Fire Station in Mormon Lake, the Summit Fire District, east of Flagstaff, and the Forest Service fire departments located in Flagstaff.

High-Voltage Transmission Lines

Western's proposed switchyard would intersect with two existing Western 345-kV electrical transmission lines at the far western side of the health, safety, and security evaluation area. The existing lines extend north to south and carry electricity from the Navajo Generating Station near Page, Arizona, and Glen Canyon Dam on the Colorado River to the metropolitan Phoenix area.

Existing electrical transmission lines create the potential for electrical safety hazards in the immediate vicinity of the lines and the potential for personal injury, property damage, or fire in the event of transmission tie-line fault, lightning strike, or structure collapse. Electrical transmission lines present a safety risk from electrocution, although no safety issues associated with the existing 345-kV transmission lines have been reported. Statewide, six deaths were recorded in 2008 with the Industrial Commission of Arizona as a result of contact with objects and equipment associated with electrical generation and transmission (Industrial Commission of Arizona 2008).

Potential health risks from electric and magnetic fields (EMF) associated with the existing 345-kV transmission lines are less clear. Both current and voltage are required to transmit electrical energy over a transmission tie-line. The current, a flow of electrical charge measured in amperes (A), creates a magnetic field. The voltage, the force or pressure that causes the current to flow measured in units of volts (V) or thousand volts (kV), creates an electric field. Both fields occur together whenever electricity flows, hence, the general practice of considering both as EMF exposure.

The possibility of deleterious health effects from EMF exposure has been a public concern for many years about living or spending time near high-voltage lines. The available data from hundreds of studies conducted over more than 25 years have not revealed any conclusive evidence that EMF exposure from power lines poses a hazard to animal or human health. However, while such a hazard has not been established from the available evidence, the same evidence does not serve as proof of a definite lack of a hazard. Overhead power lines usually emit a stable EMF that fluctuates widely as current changes in response to the changing electrical load. These EMFs are highest under the transmission lines and drop off quickly as distance from the line increases (Western Area Power Administration 2005). Given the rural nature of the existing transmission tie-line rights-of-way, and the fact that no residences are located immediately adjacent to, or in the vicinity of, the existing transmission lines, no human health or safety issues associated with EMF are currently present within the health, safety, and security evaluation area.

3.10.2 Environmental Consequences

This section examines concerns for health, safety, and security of workers and the public that could arise from the construction or operation of the proposed wind park, transmission tie-line, and Western's switchyard.

3.10.2.1 Standards of Significance

The proposed project components and alternatives would have significant and adverse effect on public and occupational health, safety, and security if:

- Construction and operation of the proposed project components would result in a substantial increase in health and safety risks or serious injuries to workers, visitors to the area, or area land users.
- EMF levels would substantially increase near sensitive land uses.
- Construction, operation, and maintenance activities would impair implementation of, or physically interfere with, an adopted emergency response plan or emergency evacuation plan.
- Construction or operation of the proposed project components would cause substantial changes in traffic patterns resulting in hazardous driving conditions for motorists.
- Project implementation would violate local, State, or Federal regulations regarding handling, transport, or containment of hazardous materials.

3.10.2.2 Foresight's Proposed Project and Proposed Federal Actions

Potential public health and safety hazards are greatest during the construction phase, but they can be effectively minimized by complying with applicable Federal and State occupational safety and health standards, and with application of the RPMs listed in Section 2.7. On December 1, 2006, the Secretary of Energy issued a memorandum concerning the "Need to Consider Intentional Destructive Acts in NEPA Documents." This section of the EIS addresses the threat of "intentional destructive acts" (i.e., acts of sabotage or terrorism).

Occupational Hazards

Wind Park, Transmission Tie-line, and Switchyard Construction

In general, human health and safety concerns associated with the construction of the proposed project components include the movement of large construction vehicles and equipment and materials, falling overhead objects, falls into open excavations, and electrocution. These concerns are most relevant to construction personnel who would be working on-site.

Foresight, Western, and the Forest Service are committed to enforce the applicable health and safety practices identified in Section 2.7. Application of these RPMs would minimize occupational hazards associated with construction and would not result in a substantial increase in health and safety risks or serious injuries to workers, visitors to the area, or area land users.

Wind Park Operations and Maintenance

Operational hazards of the proposed wind park would include the possibility of tower collapse, blade failure, or ice shedding. The advancement of turbine technology has eliminated much of the potential for impacts to workers or public safety and security. Technological improvements and mandatory safety standards for turbine design, manufacturing, and installation have largely eliminated occurrences of tower collapse and blade failure. Modern utility-scale turbines are certified according to international engineering standards, which include ratings thresholds for withstanding different levels of hurricane-

strength winds and other criteria. Due to the climate of northern Arizona, turbine icing would be expected to occur at times during operation. However, any ice that accumulates on the rotor blades would likely cause an imbalance or otherwise alert turbine sensors, which are designed to shut down. As the ice begins to thaw, it would typically drop straight to the ground. Any ice that remains attached to the blades as they begin to rotate could be thrown some distance from the tower; however, such a throw would usually result in the ice breaking into small pieces and falling near the tower base. For security and safety reasons, signs would be posted at the entrance of wind park access roads to alert the public and maintenance workers of potential ice shedding risks. With the advancements in turbine technology, combined with the limited number of workers and members of the public expected during the operational phase, the proposed wind park would not result in a substantial increase in health and safety risks or serious injuries to workers, visitors to the area, or area land users due to any tower collapse, blade failure, or ice shedding.

Transmission Tie-line and Switchyard Operations and Maintenance

Operation of the proposed transmission tie-line and switchyard would result in increased EMF levels in the immediate vicinity of the facilities. Public exposure to EMF specific to transmission tie-line and switchyard operation would be unlikely, however, due to the fact that no residences are located within the vicinity of the proposed facilities; the residence at the Flying M Ranch is over one-half mile from the proposed transmission tie-line, and several miles from the proposed switchyard.

Regardless, EMF created by the transmission tie-line would be reduced through the incorporation of low-EMF designs as detailed in Section 2.7. Based on these RPMs, the operation of the transmission tie-line would not substantially increase EMF levels near sensitive land uses, and significance thresholds associated with EMF would not be exceeded.

EMF would also be produced within the switchyard, but due to the spacing of electrical equipment measured field strengths would be low outside the fence line. In general, EMF close to a switchyard is produced mainly as a result of entering power lines. Western would comply with Federal and industry standards for designing and installing electrical equipment related to the switchyard. As a result, low EMF levels would result from the operation of the proposed switchyard.

Public Safety and Site Security

Wind Park, Transmission Tie-line, and Switchyard Construction

Potential hazards to public safety as a result of the construction of the proposed project components are generally limited to increased construction traffic (e.g., over-width, slow-moving vehicles on smaller roadways; increased vehicular traffic from construction personnel) and possible route detours and/or closures.

Public exposure to health or safety problems from general construction activities would be unlikely because of the implementation of safety regulations and plans and because the area is lightly populated with only one residence near the western boundary of the proposed wind park. Additionally, the general public would not be allowed near the proposed wind park, transmission tie-line, and switchyard construction areas.

The general public could be exposed to construction-related hazards due to the passage of large construction equipment on area roads. Increased traffic impacts during the wind park construction would most likely occur near the I-40/Meteor Crater interchange, along Meteor Crater Road and Chavez Pass Road. Transport of WTG components and other large project components via semi-trucks would vary depending on available cranes for assembly, but Foresight has indicated that, at peak construction, up to

26 semi-truck loads could be transported and unloaded within the wind park per equipment delivery day. In addition, approximately 250 to 400 workers would add traffic to local roadways as they commute to and from the work site. Approximately 315 vehicles per day use Meteor Crater Road to visit Meteor Crater, and small amounts of local traffic also use the road. Foresight would develop a traffic control plan in consultation with the Coconino County Public Works Department prior to the start of construction. This limited amount of traffic utilizing the I-40/Meteor Crater Road interchange and Meteor Crater Road, combined with the traffic control plan for the interchange and road, is not expected to cause substantial changes in traffic patterns resulting in hazardous driving conditions for motorists. Applicable significance standards to public safety from transportation related to the construction of the wind park would not be exceeded.

Increased traffic impacts for the proposed transmission tie-line and Western's proposed switchyard would occur near the Lake Mary Road/FS 125 intersection. Some restriction or temporary closure of FS 125 could also occur during the delivery of equipment and materials to the transmission tie-line right-of-way or to the proposed switchyard site. These would be intermittent and temporary, and would be managed with approved traffic control plans, which would be developed by Foresight in consultation with Coconino County Public Works Department. Thus, substantial changes in traffic patterns resulting in hazardous driving conditions for motorists would not occur.

Road detours or closures would have the potential to affect emergency services. To avoid a negative consequence, construction managers would coordinate with local fire and emergency service personnel and with land management agencies to ensure that they are aware of where various construction activities are occurring in order to avoid potential conflicts between construction activity and the provision of emergency services.

Wind Park Operations and Maintenance

Potential hazards to public safety as a result of the operations and maintenance of the proposed wind park includes wildfires and risk to pilots during low-level aerial flights. Intentional destructive acts, such as an attack of terrorism, are also considered.

The installation of WTGs and met towers would create a potential for collisions with low-flying aircraft. Safety hazards to aircraft as a result of the proposed wind park are disclosed in Section 3.9 (Transportation).

In order to minimize the risk of wildfires, the electrical components of the proposed wind park would be inspected for system and grid safety prior to being brought on line. This inspection, along with implementation of built-in safety systems, minimizes the chance of fire occurring. However, fire at these facilities could result from a lightning strike, short circuit, or mechanical failure/malfunction. The SCADA system would sense any of the above occurrences and report to the wind park control center. Such a centralized system would monitor the condition of the wind park's equipment, alert service technicians to any fault or alarm conditions, and automatically shut down equipment, as necessary.

Generally, any fire or other emergency situations at a WTG site, step-up substation, or other wind park facility that are beyond the capabilities of the local service providers would be the responsibility of the facility operator. Construction and maintenance personnel would be trained and have the equipment to deal with emergency situations that could occur at these facilities; therefore, such an incident would generally not expose local emergency service providers or the general public to any public health or safety risk. Furthermore, the Emergency Response Plan developed for the wind park and transmission tie-line would contain emergency fire precautions, notification procedures, and emergency response sequences; comply with standards published by the National Fire Protection Association; and be reviewed

and approved by the Coconino County Fire Marshall prior to issuance of a building permit for the wind generating facility.

To reduce safety and security concerns during operations and maintenance, public access to the proposed wind park would be limited by the terms and conditions established by affected land owners and management agencies. If granted by the landowner and the wind park owner/operator, the public could have a right of access over portions of the wind park on which the wind turbines and other wind facility components are located. There is no plan to gate the entire wind park, although access to, and within, the wind park site could be controlled. It is expected that signs would be posted at the wind park to warn of the potential hazards associated with the wind park, but the public would still have access to these areas for dispersed recreation. Year-round access to the wind park would be maintained so operators can monitor the facilities and equipment and quickly respond to any unforeseen condition that might impact the safety of the operations staff or the public.

Certain wind park facilities, including the step-up substations at the wind park site and the O&M facility, would be fenced with warning signs and have security lighting. The wind park is designed in such a way, as described in Chapter 2, to reduce potential sabotage and terrorism-related impacts. Some of these design characteristics include fencing at the switchyard and step-up substations and warning signs on locks and equipment. Western and the Forest Service believe that the wind park presents an unlikely target for an act of terrorism, with an extremely low probability of attack. The potential for the wind park to be targeted in terrorism-related activity would be negligible. All authorized personnel would be issued specific keys and/or access codes to regulate entry into wind park facilities, including the step-up substations, O&M facility, and individual WTGs. These measures would limit access and deter intruders.

Transmission Tie-line and Switchyard Operations and Maintenance

The proposed transmission tie-line would include towers less than 200-feet tall. Likewise, Western's proposed switchyard would include a communications tower and several new transmission structures that would be less than 200-feet tall. Safety hazards to aircraft as a result of the proposed transmission tie-line and Western switchyard are disclosed in Section 3.9 (Transportation).

In order to minimize the risk of wildfires, the electrical components of the proposed transmission tie-line and Western's proposed switchyard would be inspected for system and grid safety prior to being brought on line. This inspection, along with implementation of built-in safety systems, minimizes the chance of fire occurring. However, fire at these facilities could result from a lightning strike, short circuit, or mechanical failure/malfunction. Western's proposed switchyard would be monitored and controlled from Western's control center through its SCADA system. The system would respond to any condition that could cause fire-related hazards.

The proposed transmission tie-line right-of-way would not be fenced, but public vehicle access along the right-of-way could be controlled or restricted on Forest Service-managed lands if illegal use becomes an issue. Western's proposed switchyard would be fenced with a locked gate and posted with signs. Access to the switchyard would only be for Western employees and approved contractors. Western and the Forest Service believe that the proposed transmission tie-line and switchyard present an unlikely target for an act of terrorism, with an extremely low probability of attack. The potential for the transmission tie-line or switchyard to be targeted in terrorism-related activity would be negligible.

Environmental Hazards

Wind Park, Transmission Tie-line, and Switchyard Construction

Chemicals or other potentially hazardous materials used during construction would include diesel fuel, lubricants, and hydraulic fluids. These hazardous materials are used for operating construction equipment and are transported in small amounts, making public or environmental exposure unlikely and limited in severity. Implementation of RPMs identified in Section 2.7 would ensure applicable spill and hazardous waste requirements are met and significance standards would not be exceeded.

Wind Park, Transmission Tie-line, and Switchyard Operations and Maintenance

Western's proposed switchyard and the proposed step-up substations would include transformers with oil. Implementation of RPMs identified in Section 2.7 would ensure applicable spill and hazardous waste requirements are met and significance standards would not be exceeded. If required, secondary containment would be installed within the switchyard to prevent the migration of oil from the switchyard site.

3.10.2.3 Alternative Transmission Tie-line Corridor

Health, safety, and security impacts associated with construction and operation of the alternative transmission tie-line would be the same as those described for the proposed transmission tie-line.

3.10.2.4 No Action Alternative

The No Action Alternative would result in no new impacts to human health, safety, and security because under this alternative, Western would not approve an interconnection for the Grapevine Canyon Wind Project and the Forest Service would not issue a permit for the transmission tie-line proposed for the wind park. The wind park, transmission tie-line, and switchyard would not be constructed.

3.11 NOISE

3.11.1 Affected Environment

3.11.1.1 Resource Evaluation Area

The resource evaluation area for noise impacts conservatively included an area up to one mile from the wind park study area, transmission tie-line, interconnection switchyard, and primary access roads, to incorporate any nearby sensitive receptors such as residences, schools, businesses, or public buildings.

3.11.1.2 Characterization

Fundamentals of Sound and Noise

People perceive sounds through sensations in the ear that are caused by pressure variations. Sounds can be distinguished by a loudness (sound pressure) component, measured in decibels, and a frequency component, measured in Hertz. Sound travels through the air as waves of air pressure fluctuations caused by vibration. Because energy contained in a sound wave is spread over an increasing area as it travels away from the source, loudness decreases with distance.

A decibel (dB) is the unit used to describe the amplitude of sound. Sound level measurements that are weighted to how humans perceive them are called A-weighted and are denoted by the unit dBA. The dBA scale reflects the response of the human ear by filtering out some of the noise in the low and high frequency ranges that the ear does not detect well. The primary assumption is that the dBA is a good correlation to a human's subjective reaction to noise. The A-weighted scale is used in most noise

ordinances and standards. The dBA scale is logarithmic; therefore, individual dBA ratings for different sources can not be added directly to calculate the sound level for combined sources. For example, two sources, each producing 50 dBA would, when added logarithmically, produce a combined sound level of 53 dBA. In general, a 3-dBA increase in sound level is considered barely noticeable to humans; a 5-dBA increase is clearly noticeable, and a 10-dBA increase is considered a doubling of the sound level.

One of the most common ways of describing noise levels is in terms of the continuous equivalent sound level (Leq) over a monitoring period. Leq is the most commonly used descriptor in noise standards and regulations. The Leq is defined as the average noise level for a stated period of time (such as hourly or daily). The one-hour Leq is noted as Leq (1); the Leq over 24 hours is written as Leq (24). The Leq is weighted because loud and infrequent noises have a greater effect on the resulting level than quieter, more frequent noises. The Leq tends to weight the higher sound levels. The 24-hour Leq with a 10 dBA "penalty" for the noise-sensitive hours between 10:00 p.m. and 7:00 a.m. is known as Ldn (day-night noise level). The Ldn attempts to account for the fact that noise during this specific period of time is a potential source of disturbance with respect to normal sleeping hours.

Noise Standards

There are no Federal or State noise standards that regulate wind parks, nor does Coconino County have local regulations or ordinances for noise. The EPA has, however, developed guidelines for evaluating noise impacts that are generally accepted and used in noise analyses (EPA 1974). As a standard for residences and other noise-sensitive receptors, the EPA recommends a Ldn of 65 dBA, or 55 dBA (Leq) averaged over 1 and 24 hour periods.

Noise Sensitive Receptors and Background Conditions

The noise evaluation area is generally rural and undeveloped with few, and widely scattered, residences (refer to Figure 3.1-4 for map of existing land uses). The only residence in the vicinity of the noise evaluation area is part of the Flying M Ranch, located near the wind park study area's western boundary, off of FS 126. Flying M Ranch consists of a primary residence and numerous other structures located approximately 350 feet west of the wind park study area boundary. This ranch consists of historic homesteads which date back as early as 1914, located on private and State-leased lands (Diablo Canyon Trust 2011). Structures associated with the Raymond Ranch Wildlife Area are located just over one mile north of the wind park study area. No other residence, school, business, or public building is found within one mile of the noise evaluation area. Other land uses in the area include dispersed recreation and camping, which occur primarily near Pine Hill on Anderson Mesa, within one mile of the proposed transmission tie-line and switchyard.

Baseline noise measurements were not conducted for this EIS. For assessment purposes, the baseline noise levels were assumed to be similar to those outlined by EPA for common noise sources (Table 3.11-1). The rural nature of the area would correlate to average noise levels in the 40 to 50 dBA range. Ambient noise in rural areas is commonly made up of rustling vegetation, ranching activities, airplanes, and infrequent vehicle pass-bys. Higher ambient noise levels, typically 60 to 65 dBA, could exist near the Meteor Crater Visitor Center as a result of vehicle traffic and tourism activities. Table 3.11-1 depicts noise levels associated with common everyday sources, and is provided here as context for interpreting the magnitude of noise levels discussed in this EIS.

TABLE 3.11-1 COMMON NOISE SOURCES AND LEVELS			
Noise Source	**Average Noise (dBA)**	**Loudness (relative to normal conversation = 1)**	**Range of Noise (dBA)**
Ambulance siren (100 feet)	100	16	95–105
Motorcycle (25 feet)	90	8	85–95
Typical construction site	85	6	80–90
Single truck (25 feet)	80	4	75–85
Urban shopping center	70	2	65–75
Single car (25 feet)	65	1.5	60–70
Within 100 feet of a highway	60	1	55–65
Normal conversation (5 feet apart)	60	1	57–63
Residential area during day	50	0.5	47–53
Recreational area	45	0.4	40–50
Residential area at night	40	0.3	37–43
Rural area during day	40	0.3	37–43
Rural area at night	35	0.2	32–37
Quiet whisper	30	0.1	27–33
Threshold of hearing	20	0.06	17–23
Source: EPA 1974			

3.11.2 Environmental Consequences

3.11.2.1 Standards of Significance

The effects of noise on people fall into three general categories: 1) subjective effects of annoyance, nuisance, and dissatisfaction; 2) interference with such activities as speech, sleep, and learning; and 3) physiological effects such as startling and hearing loss. In most cases, environmental noise produces effects in the first category only. However, residents who live close to roads and industrial facilities could experience noise effects in the second and third category.

A significant effect from noise would occur if project implementation would result in:

- Exceeding the EPA guidelines recommending a day-night average sound level of 65 dBA (Ldn) or 55 dBA averaged over 1 and 24 hour periods for sensitive receptors.

3.11.2.2 Foresight's Proposed Project and Proposed Federal Actions

This section evaluates potential noise impacts that could result from construction, operation, and maintenance of the proposed wind park, transmission tie-line, and switchyard.

Construction

Noise levels associated with construction of a wind park, transmission tie-line, and switchyard would vary greatly depending on the type of equipment, construction schedule, and condition of the area being worked. Construction activities would primarily be limited to daytime hours; nighttime construction activities within the wind park study area and along the transmission tie-line would only occur with approval of the land management agencies or landowners. All construction activities would occur within the boundaries of the wind park study area, along new access roads, within the 200-foot-wide right-of-

way, along proposed spur roads for the transmission tie-line, and within the proposed staging and footprint areas for Western's proposed switchyard and new dead-end structures.

Noise would also be generated from vehicle traffic. On-site vehicular traffic would include hauling of materials in and out of the construction site, movement of heavy equipment, and worker traffic. Construction and worker vehicle access to the proposed project components would occur along the proposed primary wind park access road (located off of Meteor Crater Road), Chavez Pass Road, and FS 125. To access these roads, however, construction vehicles could be traveling over interstate, regional, and local roads as well. The number of truck trips associated with construction would vary, depending on the construction stage, but overall the total traffic volume along local roads would increase during high activity periods of the construction phase. Noise increases would be common during the construction phase along the primary wind park access roads.

Activities associated with site development, transportation, construction, equipment installation, and startup and testing would emit noise during the hours of on-site activity. Table 3.11-2 presents noise levels of various types of construction equipment and activities at distances of 50 feet, 500 feet, and 1,500 feet.

TABLE 3.11-2
NOISE LEVELS FROM POTENTIAL CONSTRUCTION EQUIPMENT AT VARIOUS DISTANCES

Construction Equipment	Typical Sound Pressure at 50 Feet (dBA)	Typical Sound Pressure at 500 Feet (dBA)	Typical Sound Pressure at 1,500 Feet (dBA)
Dozer (250-700 hp)	88	68	58
Front end loader (6-15 cu. yards)	88	68	58
Trucks (200-400 hp)	86	66	56
Grader (13 to 16 ft. blade)	85	65	55
Shovels (2-5 cu. yards)	84	64	54
Portable generators (50-200 kW)	84	64	54
Derrick crane (11-20 tons)	83	63	53
Mobile crane (11-20 tons)	83	63	53
Concrete pumps (30-150 cu. yards)	81	61	51
Tractor (3/4 to 2 cu. yards)	80	60	50
Concrete batch plant	83	n/a	n/a

Source: EPA 1971; Barnes et al. 1976; FHWA 2006.

Wind Park

Construction of the proposed wind park would include the following noise-generating activities over the planned 12 to 18 month construction period for each 250 MW phase.

- Site and right-of-way clearing
- Access road construction
- Vehicle movement
- Concrete batch plant operation
- Rock crushing
- Blasting
- Foundation excavation and construction

- Wind turbine structure erection
- Underground electrical collection system installation
- Substation installation
- Site cleanup and restoration

Construction noise levels would be variable and intermittent, as equipment is operated on an as-needed basis. Construction equipment would move from one WTG site to the next, so construction noise levels would not dominate one area, except for the operation of the proposed batch plant. The batch plant and other stationary construction equipment would be sited a minimum of one-half mile from residential structures. Infrequent blasting activities could occur at the borrow pits or associated with construction of the WTG foundations. If blasting activities are necessary, they would be limited in nature and would be conducted in strict compliance with safety and public notification/warning requirements, and in accordance with applicable Federal and State regulations. The primary access route to the wind park extends southwest from Meteor Crater Road into the wind park study area. Service roads specific to the construction of the wind park would be built in conjunction with the WTGs and collector system and would not be located within one-half mile of any sensitive receptors. Potential noise impacts would be greatest at the highest number of peak-hour trips and total heavy-duty truck trips. Construction workers in light-duty vehicles would typically travel to the site during the morning and afternoon.

Construction activities normally would be limited to daytime hours and thus would not impact existing background noise levels at night. Construction activities within the wind park would only occur during nighttime with approval of the land management agencies or landowners. At one mile, construction related noise during the day, and at night if construction activities are requested and approved, would be comparable to that of background levels in the area.

The only noise-sensitive receptors in the general vicinity of the proposed wind park include the residents of the Flying M Ranch (near the western boundary of the wind park study area) and the Raymond Ranch Wildlife Area (north of the wind park study area). Because both of these areas are located outside of the wind park study area and construction activities associated with the wind park facilities would be located more than one-half mile from residences, noise from construction is expected to be minimal. If it is determined that blasting would be required within one mile of the Flying M Ranch, the owner would be notified. No other features of the wind park, including the staging areas, batch plant, rock crusher, or substation would be located in the vicinity of any residential buildings or other sensitive receptors. No construction equipment traffic associated with the wind park is expected to enter the wind park study area through FS 126 which passes within several hundred feet of the Flying M Ranch Winter headquarters.

Construction workers would be protected from adverse noise effects by equipment and procedures dictated by law and project construction specifications. Due to the intermittent and temporary nature of noise impacts of wind park construction and the distance to sensitive receptors, noise levels are not expected to exceed the EPA guidelines recommending a day-night average sound level of 65 dBA (Ldn) or 55 dBA for sensitive receptors. Significance standards related to noise from the construction of the proposed wind park would not be exceeded.

Transmission Tie-line and Switchyard

Construction of the transmission tie-line would occur over several months, but noise-generating activities would be intermittent. Noise impacts specific to the construction of the transmission tie-line would result from heavy construction equipment and trucks used along the access roads and right-of-way. Construction equipment would move from one structure site to the next, so construction noise levels would not dominate one area. Blasting with explosives could be used as needed for the structure

foundations, based on local geologic conditions. Relatively high peak noise levels in the range of 83 to 88 dBA would occur within 50 feet of the transmission tie-line structure sites and the proposed switchyard. While not anticipated, difficult terrain along the slopes of Anderson Mesa could require some structures and/or conductors to be installed via helicopter. For potential transmission tie-line structure sites where workers or equipment would be delivered by helicopter or sky crane, the approach, landing, and takeoff would be an additional noise source. Noise from medium-lift helicopters typical of those that would be used is in the range of 90 to 100 dBA at 50 to 100 feet (FAA 2004). If helicopter construction is required, helicopter staging areas would be sited a minimum of one mile from residences. Construction access for the transmission tie-line would likely be FS 125 from Lake Mary Road. In eastern sections of the proposed transmission tie-line alignment where FS 125 deviates from the transmission tie-line alignment, a new access road or spur roads would be constructed to or within the 200-foot transmission tie-line right-of-way.

With the exception of the Flying M Ranch, which is approximately 2,000 feet at its nearest point from the proposed transmission tie-line, no other receptors are located within one mile of the proposed transmission tie-line or switchyard. Ranch residents are likely to experience intermittent peak noise levels above ambient conditions, but due to the distance from noise sources, noise levels are not expected to exceed the EPA guidelines recommending a day-night average sound level of 65 dBA (Ldn) or 55 dBA for sensitive receptors. Significance thresholds related to noise impacts from the construction of the proposed transmission tie-line would not be exceeded.

Construction of the proposed switchyard would occur over approximately seven months, but noise-generating activities would be intermittent and limited to the operation of construction equipment. Construction access for the proposed switchyard would be from FS 125 from Lake Mary Road. There are no residential structures or sensitive noise receptors near Western's proposed switchyard site. Therefore, noise levels from construction would not lead to impacts to sensitive receptors, and significance thresholds for noise would not be met.

The majority of the transmission tie-line and Western's switchyard are proposed on Forest Service-managed lands where recreational uses are intermittent and temporary. Noise impacts to recreationists would most likely be limited to those camping, hiking, hunting, or conducting other forms of dispersed recreation in the vicinity of Pine Hill, near the western end of the transmission tie-line alignment and the proposed switchyard. Construction activities normally would be limited to daytime hours and, thus, would not impact existing background noise levels at night. Construction activities would only occur during night-time hours with approval of the Forest Service. Due to the dispersed nature of recreational activities, it is expected recreationists would pick sites away from areas subject to noise increases from the construction of the proposed transmission tie-line and Western's proposed switchyard.

Operation and Maintenance

Wind Park

Noise-producing components of the wind park during operation and maintenance include the wind turbines, the transformer at the step-up substations, and intermittent vehicle traffic.

WTGs emit perceptible noise when in motion, emanating from the aerodynamic and mechanical functions of each turbine. A turbine's sound power represents the sound energy at the center of the blades, which propagates outward at the height of the hub. Mechanical noise is generated by the turbine's internal gears. Utility scale turbines are usually insulated to prevent mechanical noise from proliferating outside the nacelle or tower (Alberts 2005). Aerodynamic noise is generated by the blades passing through the air. The power of aerodynamic noise is related to the ratio of the blade tip speed to wind speed. Noise levels can vary depending on wind speed and distance of the listener from the turbine. Noise levels

would be higher on windy days; there are some circumstances in Winter where ice can form on a wind turbine blade, creating temporarily higher levels of turbulence noise.

Foresight anticipates that the Vestas V100 1.8 MW turbine would be one of the turbines considered for the project. The Vestas V100 brochure (Vestas 2009) indicates that the sound power for this type of turbine would be between 95–107 dBA, which is similar to other 2.0 MW class turbines. Alberts (2005) has measured noise levels at the base of a similar Vestas structure at 58 to 60 dBA.

Most modern industrial wind turbines are designed to keep noise levels at or below 45dB at 1,000 feet, which should drop to 35 to 40dB at a bit over one-half mile (Acoustic Ecology Institute 2007), which is generally consistent with typical night-time ambient noise levels in rural areas. In the U.S., wind facilities often have setbacks to minimize the potential impacts from nearby residents. According to Acoustic Ecology Institute (2007), a one-half mile setback is acceptable if the goal is to minimize impacts on residents, though preference is for a one mile setback, which would offer near assurance of avoiding or minimizing noise issues. The closest residence to the proposed wind park, at Flying M Ranch, is located approximately 350 feet west of the wind park study area boundary. The nearest proposed turbine, however, is expected to be located more than one-half mile away. As a result, noise levels from the operation of the turbines, including routine maintenance, would be minimal for the residents of the ranch, and is not expected to exceed the EPA guidelines recommending a day-night average sound level of 65 dBA (Ldn) or 55 dBA.

Electricity generated by the turbines would be collected by a network of underground and overhead 34.5-kV collection lines and delivered to the wind park's step-up substations. The new step-up substations would include a transformer to step up the voltage of the collection grid from 34.5-kV to 345-kV in order to connect to Western's 345-kV transmission system. This transformer is expected to be the major source of audible noise. The predominant noise from a transformer is a hum, which is approximately 85 dBA. Although electrical equipment has not been specified for the proposed step-up substations, transformer noise emissions would be subject to National Electrical Manufacturers Association (NEMA) standards and, therefore, would be typical for the industry.

The step-up substations and transformers would be located greater than one-half mile away from sensitive receptors and would not negatively affect them. Occasional noise from routine maintenance at the step-up substations would create traffic noise, but not at levels that is expected to exceed the EPA guidelines recommending a day-night average sound level of 65 dBA (Ldn) or 55 dBA for sensitive receptors.

Transmission Tie-line and Switchyard

Audible noise associated with transmission lines is a result of corona discharge and is a function of line voltage. The amount of audible noise is directly related to the level of corona activity, which in turn is affected by the conductor's physical condition and contamination as well as meteorological conditions, most notably rain. Transmission line audible noise is characterized by cracking, frying, sputtering, and low frequency tones, which are best described as humming sounds. Audible noise from transmission lines primarily occur during foul weather conditions. Audible noise increases during dust storms or rain events, although it is generally masked by the background noise of rain and wind. In dry fair weather conditions, the conductors operate below the corona-inception level, and noise effects typically do not extend beyond the right-of-way. Because there are no permanent noise receptors located closer than 2,000 feet from the proposed transmission line, corona noise would dissipate with distance and no impacts would be expected.

The proposed switchyard would also generate noise during operation as a result of corona and occasionally disconnect switches and circuit breakers operations which create momentary noise. The switchyard facilities would also be subject to NEMA noise standards. Because of its remote location,

noise generated at the switchyard would not impact any sensitive noise receptors. Due to the dispersed nature of recreational activities, it is expected recreationists would pick sites away from the switchyard to conduct recreational activity. However, operational noise of the switchyard would dissipate with distance and is not expected to be heard at 2,000 feet and beyond except for an occasional trip of a circuit breaker due to a transmission line fault.

Occasional maintenance activities on the proposed transmission line and switchyard would be required. Noise impacts from these activities would be intermittent and applicable significance thresholds would not be exceeded.

3.11.2.3 Alternative Transmission Tie-line Corridor

The alternative transmission tie-line alignment would not result in additional noise impacts from that described under the proposed transmission tie-line. The location of the alternative alignment is within one-half mile of the proposed alignment, and no residents or other receptors are located in the area. As a result, noise impacts would be similar to those described under Foresight's proposed transmission tie-line alignment.

3.11.2.4 No Action Alternative

Under the No Action Alternative, the proposed project components would not be constructed or operated. Potential noise impacts associated with the construction and operation would not occur. The local noise conditions would continue according to current patterns and the impacts described for the proposed project components would not occur.

3.12 VISUAL RESOURCES

3.12.1 Affected Environment

3.12.1.1 Resource Evaluation Area

The evaluation area for visual resources extends three miles in all directions from the wind park study area and extends north to I-40. In addition, the visual resources evaluation area extends one mile to either side of the proposed transmission tie-line and Western's proposed switchyard. The visual resources evaluation area was selected based on the scale and geographic extent of the proposed project components. This evaluation area was determined in an effort to include areas where the proposed project would be visible to the highest number of viewers, the most prolonged views, and areas where concern for views is considered high. Additionally, the visual resources evaluation area was refined to eliminate areas beyond which the discernible details of the proposed project components begin to vanish.

Visual resources were evaluated through research of existing documents including the Forest Plan, Coconino County Comprehensive Plan, and the Diablo Canyon RPA. Further, information was gathered through aerial photography, geographic information system (GIS) analysis, and a site visit.

The analysis for visual resources was based on the methods outlined in the Scenery Management System (SMS) used by the Forest Service. The wind park study area is not located on Forest Service-managed lands and is not subject to the management objectives of the SMS. The proposed transmission tie-line and Western switchyard are located on Forest Service-managed lands and are subject to the SMS. To be consistent, the SMS was used throughout the proposed project to evaluate the expected visual change in the existing setting.

The SMS was introduced in 1995 and replaced the Visual Management System (VMS). Although one of the specific goals of the Forest Plan is to transition from the VMS to the SMS, it has not yet occurred. The Forest Service is required to begin using SMS to replace concepts and terminology of the VMS used during the Forest planning process. The major difference between the two systems is a more complete discussion of the "Landscape Character" with SMS. The SMS involves characterization and grading of the landscape related to visual resources, and establishment of objectives to ensure that Forest Service decisions are in harmony with the desired visual setting. Because the Forest Plan was completed prior to the introduction of the SMS, it uses terminology from the VMS. In order to be consistent with the Forest Plan, terminology as it relates to Visual Quality Objectives (VQOs) comes from the VMS. The SMS equivalent of a VQO is a Scenic Integrity Level (SIL).

A worksheet translating the language used between the two systems is included as Figure 3.12-1. The SILs (categories from SMS) range over five levels of integrity from very high to very low and are shown on the left side of the worksheet. Corresponding levels of VQOs (categories from VMS) are shown on the right side of the worksheet.

FIGURE 3.12-1

SCENERY MANAGEMENT SYSTEM **Scenic Integrity Levels**		**VISUAL MANAGEMENT SYSTEM** **Visual Quality Objectives**
VERY HIGH	(unaltered)	PRESERVATION
Very High scenic integrity refers to landscapes where the valued landscape character "is" intact with only minute if any deviations. The existing landscape character and sense of place is expressed at the highest possible level.		
HIGH	(appears unaltered)	RETENTION
High scenic integrity refers to landscapes where the valued landscape character "appears" intact. Deviations may be present but must repeat the form, line, color, texture, and pattern common to the landscape character so completely and at such scale that they are not evident.		
MODERATE	(slightly altered)	PARTIAL RETENTION
Moderate scenic integrity refers to landscapes where the valued landscape character "appears slightly altered." Noticeable deviations must remain visually subordinate to the landscape character being viewed.		
LOW	(moderately altered)	MODIFICATION
Low scenic integrity refers to landscapes where the valued landscape character "appears moderately altered." Deviations begin to dominate the valued landscape character being viewed, but they borrow valued attributes such as size, shape, edge effect and pattern of natural openings, vegetative type changes, or architectural styles outside the landscape being viewed. They should not only appear as valued character outside the landscape being viewed but compatible or complimentary to the character within.		
VERY LOW	(heavily altered)	MAXIMUM MODIFICATION
Very Low scenic integrity refers to landscapes where the valued landscape character "appears heavily altered." Deviations may strongly dominate the valued landscape character. They may not borrow from valued attributes such as size, shape, edge effect and pattern of natural openings, vegetative type changes, or architectural styles within or outside the landscape being viewed. However, deviations must be shaped and blended with the natural terrain (landforms) so that elements such as unnatural edges, roads, landings, and structures do not dominate the composition.		
Unacceptably Low scenic integrity refers to landscapes where the valued landscape character being viewed appears extremely altered. Deviations are extremely dominant and borrow little if any form, line, color, texture, pattern or scale from the landscape character. Landscapes at this level of integrity need rehabilitation. This level should only be used to inventory existing integrity. It must not be used as a management objective.		

Source: Forest Service 1995b

3.12.1.2 Characterization

Management Guidelines

The Forest Service generally manages all of the lands within the visual resources evaluation area along the western border of the wind park study area and along the proposed transmission tie-line and switchyard. The Forest Service's VQOs were established in the current Forest Plan and have been used since then to guide management decisions on the Forest. VQOs of Partial Retention, Modification, and

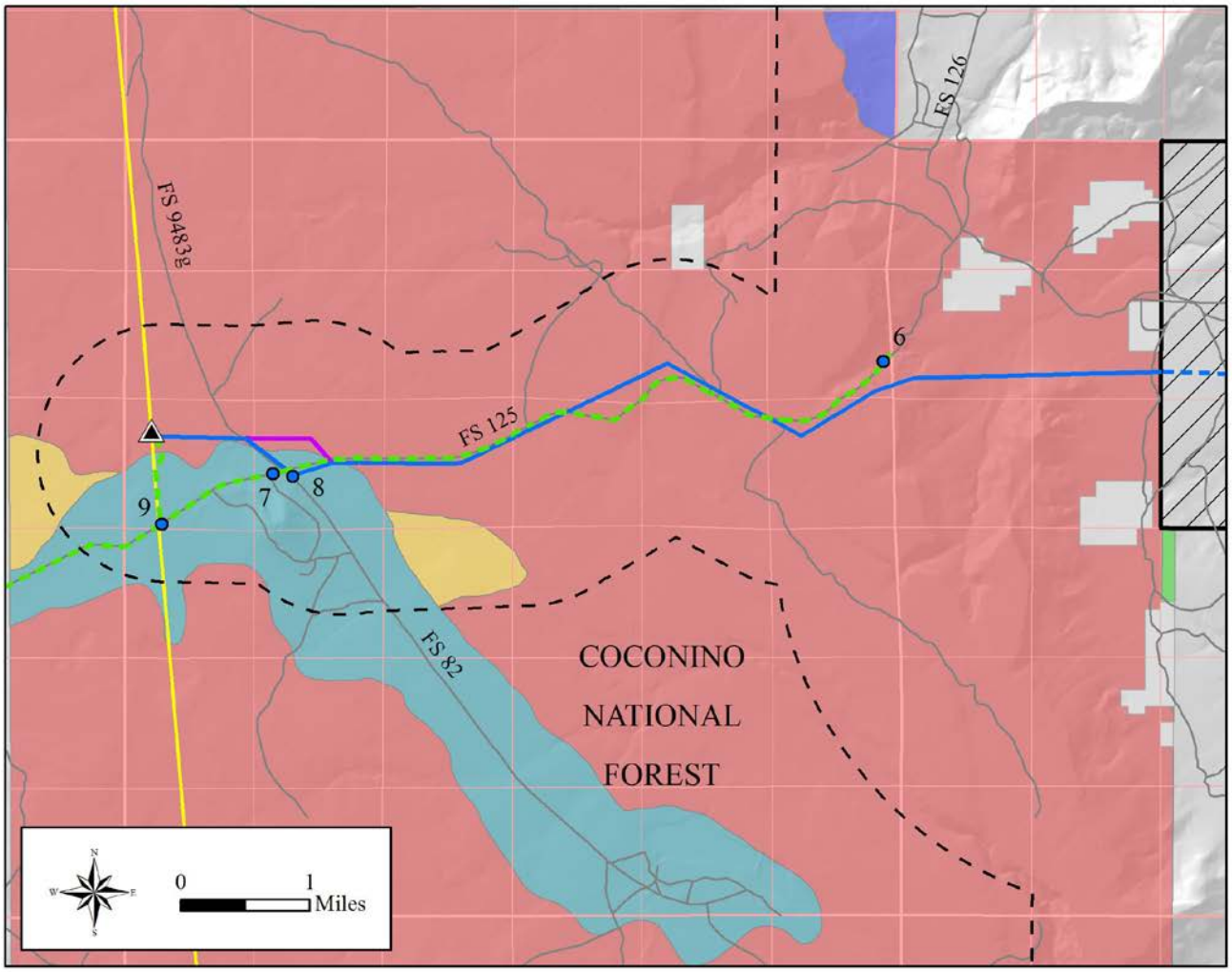
Maximum Modification are located within the visual resources evaluation area (Figure 3.12-2). Each objective is described below as presented in the VMS.

- *Partial Retention* refers to landscapes where the valued landscape character "appears slightly altered." Noticeable deviations must remain visually subordinate to the landscape character being viewed.
- *Modification* refers to landscapes where the valued landscape character "appears moderately altered." Deviations begin to dominate the valued landscape character being viewed, but they borrow valued attributes such as size, shape, edge effect and pattern of natural openings, vegetative type changes, or architectural styles outside the landscape being viewed. They should not only appear as valued character outside the landscape being viewed, but compatible or complimentary to the character within.
- *Maximum Modification* refers to landscapes where the valued landscape character "appears heavily altered." Deviations may strongly dominate the valued landscape character. They may not borrow from valued attributes such as size, shape, edge effect and pattern of natural openings, vegetative type changes, or architectural styles within or outside the landscape being viewed. However, deviations must be shaped and blended with the natural terrain (landforms) so that elements such as unnatural edges, roads, landings, and structures do not dominate the composition.

The goal of the Coconino County Comprehensive Plan, as documented in the Diablo Canyon RPA, is to "facilitate the development of alternative energy projects while maintaining the integrity of the ranches and preserving aesthetics and views." In order to accomplish this goal, two policies are set forth in the Diablo Canyon RPA (Coconino County 2005).

1. Wind projects shall be located at least one mile from major travel corridors, such as I-40 and SR 87.
2. To the extent allowed by the FAA, there shall be a minimum number of lights on the tops of the towers.

Views from major travel corridors of expressed concern include those toward the San Francisco Peaks, the Hopi Mesas, and Anderson Mesa.



Legend

- Visual Resource Evaluation Area
- Wind Park Study Area
- Proposed 345-kV Tie-line Alignment
- Proposed 345-kV Tie-line Alignment (Alignment to Be Determined)
- Alternative 345-kV Tie-line Alignment
- Proposed Interconnection Switchyard
- Existing Site Access Road
- Existing Western 345-kV Transmission Lines

Visual Quality Objectives

- Modification
- Maximum Modification
- Background Partial Retention
- Foreground Partial Retention
- Middleground Partial Retention
- Key Observation Points

Coconino National Forest
Visual Quality Objectives
Grapevine Canyon Wind Project

FIGURE 3.12-2

Regional Landscape Character

The project region is located within the transition zone between the Arizona/New Mexico Plateau Ecoregion, which covers much of northern Arizona and northwestern New Mexico. Elevations generally range between 5,500–7,250 feet. The region is fairly level; however, scattered mesas provide variety to the landscape. Anderson Mesa, a geographically delineating feature, creates a drastic rise in topography near the western edge of the proposed wind park, while the Mogollon Rim drops off the edge of the Colorado Plateau south of the proposed wind park.

The highest elevation in the region rises to over 12,000 feet, forming the San Francisco Peaks. The San Francisco Peaks are located northwest of the wind park study area and form one of the most attractive and unique visual elements within Coconino County as well as the Forest. The peaks are the remains of an extinct volcano and rise abruptly from the otherwise flat plateau, creating a regional landmark visible from great distances.

Vegetative communities of the region consist of Great Basin shrublands and grasslands in the lower elevations. The vegetation within the lower and mid elevations consists of pinyon-juniper and oak. Vegetation at higher elevations consists primarily of dense ponderosa pine forests.

The area around the Mogollon Rim is considered a destination area for outdoor recreation and is an area that provides climatic relief from Summer temperatures in the Phoenix and Tucson metropolitan areas. The distinct pine forests offer a wide variety of activities associated with scenic viewing, including photography, hiking, mountain biking, OHV use, picnicking, horseback riding, big game hunting, fishing, camping, wildlife, and recreational driving.

Visual Resource Evaluation Area Landscape Character

The majority of the visual resource evaluation area is located on a semi flat valley floor. The valley opens to the north with sweeping hills. The valley is bound on the south and west by Anderson Mesa/Chavez Mountain and is loosely bound by Sunset Mountain and Meteor Crater to the east. A few scattered ranching residences are located in the vicinity and the major land use is ranching. The overall character of the valley is naturally evolving, meaning "the landscape character expresses the natural evolution of biophysical features and processes, with very limited human intervention" (Forest Service 1995b). A few unimproved dirt roads cross through the area. The nearest major roads are I-40 to the north and SR 87 to the south. Local vegetation varies with elevation and aspect, but ranges between sparse vegetation and grasslands in the lower elevations, to dense pinyon-juniper woodlands at the edge of the mesa, to scattered ponderosa pine forests and grasslands in the higher elevations on top of Anderson Mesa. Figures 3.12-3, -4, and -5 generally illustrate the vegetation types and landscape character of the evaluation area.

Water is often a factor in evaluating landscape character. It is often considered an amenity to visual resources. Several perennial bodies of water, including Kinnikinick Lake, are located just outside of the visual resources evaluation area. Water within the visual resources evaluation area is limited to ephemeral streams or creeks, stock watering ponds, and watering tanks. However, over time water has created distinct landscape features that are apparent throughout the visual resources evaluation area in the form of canyons and draws. Three distinct drainages (Canyon Diablo, Grapevine Canyon, and Jack's Canyon) traverse the visual resources evaluation area, and in addition to Anderson Mesa, are the most evident landscape features. Canyon Diablo and Grapevine Canyon are the two most evident canyons in the area, but generally do not have flowing water.

FIGURE 3.12-3

Sparse vegetation and grasslands dominate the lower elevations. This photograph is looking west, from the rim of Meteor Crater, across the northern end of the visual resources evaluation area.

FIGURE 3.12-4

Dense pinyon-juniper woodlands at the transitional edge of Anderson Mesa and the lower elevations. This photograph is looking north from the southern end of the visual resources evaluation area.

FIGURE 3.12-5

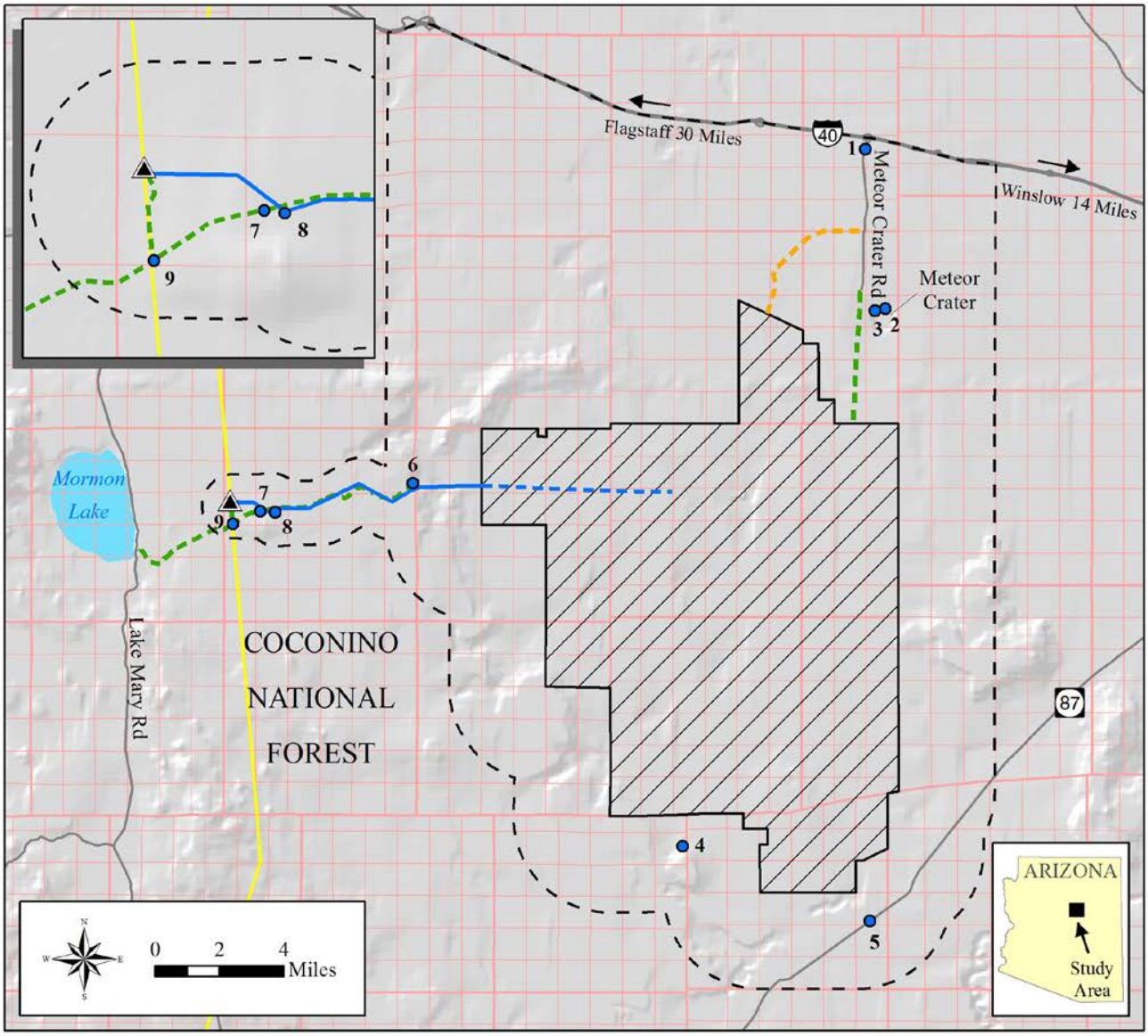
Typical higher elevations above Anderson Mesa. The photograph illustrates scattered ponderosa pine forests and grasslands that are typical in the higher elevations of the visual resources evaluation area for the tie-line.

Meteor Crater, a National Natural Landmark designated by the National Park Service (NPS), is located within the visual resources evaluation area. The crater was formed when a meteorite impacted the site approximately 50,000 years ago. The site is a popular tourist stop, with a visitor's center and guided tour around the rim of the crater. The crater is privately owned and operated. With the exception of the designation, there is no affiliation with NPS, and NPS does not manage the site or surrounding area for visual resources.

Key Observation Points

To assess visual impacts from the proposed wind park, proposed transmission tie-line, and Western switchyard, the most critical viewpoints were selected, known as key observation points (KOPs). KOPs were identified by the NEPA Interdisciplinary (ID) Team based on landscape visibility, including: 1) travelways and use areas; 2) viewer concern levels; 3) distance zones; 4) number of viewers; and 5) length of view (time duration). KOPs typically depict prominent or sensitive views. Nine KOPs were identified at the beginning of the visual analysis and are depicted in Figure 3.12-6.

The existing landscape character as seen from each of the KOPs is described below. The first five KOPs are located on private and State trust land. The remaining KOPs are located on National Forest System lands.



Legend

- Visual Resource Evaluation Area
- Key Observation Points
- Wind Park Study Area
- Proposed 345-kV Tie-line Alignment
- Proposed 345-kV Tie-line Alignment (Alignment to Be Determined)
- Proposed New Site Access Road
- Existing Site Access Road
- Proposed Interconnection Switchyard
- Existing Western 345-kV Transmission Lines

Viewing Direction from Key Observation Points

Grapevine Canyon Wind Project

FIGURE 3.12-6

KOP 1 – Interstate-40

This viewpoint looks from the southeast to the southwest near the turnoff from I-40 and Meteor Crater Road. This KOP is the closest and most heavily traveled area near the wind park study area. Typical speeds along I-40 exceed 55 miles per hour (mph). This turnoff is one of only a few stops along this stretch of I-40 and receives many visitors traveling to Meteor Crater, or the Meteor Crater gas station, convenience store, and RV park. There are few aesthetic elements when looking in this southern direction. The landscape lacks form, has very few lines, and at the season when the site visit occurred, lacked any hues and was monotone. In addition, the textures are very fine and evenly distributed. The viewer's attention is drawn across the rolling hills in the foreground, across the flat valley floor toward the rim of Anderson Mesa in the background. The landscape has rolling hills with low growing vegetation, and there are minimal disturbances to the existing views. There are no distinct elements in the view, and the landscape is indistinctive.

KOP 2 – Meteor Crater Visitor Center Patio Window

This viewpoint looks from the west to the north from the Meteor Crater Visitor's Center at what is described as the "Patio Window." This window is a focal point for tourists visiting Meteor Crater. The window, located on the patio level or courtyard of the visitor center, is oriented to the northwest and frames a view of the San Francisco Peaks. Views from within the courtyard are constrained by walls and topography except from this viewing window. The view is slightly elevated above the mostly flat valley floor. The distinct peaks create an aesthetically pleasing contrast to the flat open valley. The conical shapes of the peaks create dominance and draw attention. The sweeping curves of the road to Meteor Crater create contrast in the otherwise open plains. The elevated view creates a more pleasing view of the open grasslands across the plain. The color harmony is rich within the yellows, browns, and tans.

KOP 3 – Meteor Crater Rim

This view looks from the southwest to the northwest from the rim of Meteor Crater. Aside from the crater, there are few visually enticing elements in the landscape and minimal disturbances to the landscape from this viewpoint. The area is mostly rural and natural. This KOP is located along an approximate one-half mile guided hike that occurs daily, weather permitting. This KOP is located at one of several planned stops along the tour. From this location the guide directs visitors to look to the west and points to Canyon Diablo in reference to the location where several meteorites were discovered. This viewpoint has open views of the valley toward the north, but views are blocked to the south by the crater itself. The elevated view reiterates the lack of vegetation and water. The indistinctive landscape character offers little-to-no attraction to the viewer from this location. Colors are monotone, there are very few lines to create variations, and there are few forms. The mesa across the valley to the west is mostly flat with few prominent peaks.

KOP 4 – Chavez Pass

This view looks north from an area near the southern end of the visual resources evaluation area known as Chavez Pass. Chavez Pass rises several hundred feet toward the south end of the valley, between Chavez Mountain and Anderson Mesa. Chavez Pass Road travels through the pass, and this KOP is located on that road. Views along this section of road are expansive to the north and east. Vegetation in this area is taller and consists of junipers, sages, and grasses. There are minimal disturbances to the existing views. There are few apparent alterations in the area. Remoteness and difficult access limit the number of viewers that would visit this location. This KOP has an abundance of vegetation that creates more color and interest to a viewer. There are still, however, few forms and lines to break up the valley floor.

KOP 5 – State Route 87

This viewpoint is located in the far southern end of the visual resources evaluation area looking to the north. SR 87 supports traffic with speeds exceeding 55 mph. There are few distinct turnoffs or other elements of interest that would stop or detain people along this section of road. The San Francisco Peaks are more than 50 miles away and yet are a dominant element in the landscape. The triangular shapes of the peaks, as well as the rising edge of Anderson Mesa, offer the greatest break in the flat skyline. The rolling hills in the foreground and middleground are covered in evenly distributed junipers and help to create some interest in the viewshed by leading the viewer to look toward the background views.

The following KOPs are located on Forest Service-managed lands managed for visual resources.

KOP 6 – Forest Service Road 125

This viewpoint is located on FS 125, along the eastern edge of Anderson Mesa, looking to the east. The KOP is located on National Forest System land that has a VQO of Modification. This view is elevated above the otherwise broad valley to the east. FS 125 starts to descend down the rim of the mesa near this viewpoint, and views are generally screened by vegetation. The vegetation transitions from pines to dense junipers as the road descends downward toward the valley floor. The evenly distributed junipers start to diffuse as the hills and mesa flatten out into the broad open plain.

KOP 7 – Forest Service Road 125/Forest Service Road 82

This view looks to the east along FS 125 from a point near the intersection of FS 82/FS 9483g. This KOP is located on National Forest System land that has a VQO of Foreground Partial Retention. This natural appearing view is random with open spots that transition between low to moderately tall vegetation areas with some isolated trees in between. The conical pines and mounding junipers create a stark contrast to the flat meadows in the area. The vibrant greens and yellows create a pleasing view. There are no designated camp grounds or viewing areas that would create prolonged views of the area.

KOP 8 – Forest Service Road 82

This viewpoint is located along FS 82, south of the intersection with FS 125, looking to the north. This KOP is located on National Forest System land that has a VQO of Foreground Partial Retention. This viewpoint has many aesthetically pleasing landscape features. The shapes in the pines and junipers, as well as some rocks, create interest as do the varying colors and values that are created by the random and varying sized vegetation.

KOP 9 – Forest Service Road 125/Western Electrical Transmission Line Corridor

This viewpoint is located on FS 125, looking to the north, along an existing electrical utility corridor. The KOP is located on National Forest System land that has a VQO of Foreground Partial Retention. Partial Retention implies that the landscape character appears slightly altered. Deviations from the natural setting are to be subordinate to the natural landscape character. This KOP generally looks north along Western's existing Glen Canyon-Pinnacle Peak Transmission Line corridor. The existing utility corridor creates a funneling effect on the viewer. The vegetation removed along the transmission line corridor creates an abrupt change in the flow of the landscape. The vegetation that is not removed and manipulated is moderate to tall (15–40 feet). The abruptness of the utility corridor is the main evidence of the human disturbances in the area. The unnatural change in form is in direct contrast to the random and isolated vegetation patterns that occur along FS 125. The distinct lines from the transmission lines and conductors are in direct contrast with the soft irregular lines that exist in the naturally evolving plants in the area.

3.12.2 Environmental Consequences

3.12.2.1 Standards of Significance

Impacts to visual resources would be considered significant if any of the following conditions were to occur:

- Reduce the VQO on Forest Service-managed lands more than one classification down. The Forest Plan allows a movement downward of one level in the VQO if the Forest Service decision-maker determines it an appropriate action.
- Conflict with the goals and policies of the Coconino County Comprehensive Plan on private and/or State trust lands.

Visual resources were analyzed for consistency with management objectives and the potential to affect visual receptors within the visual resources evaluation area. Visual receptors within the visual resources evaluation area consist of travelers along the major road corridors, visitors to Meteor Crater and Meteor Crater Enterprise, Inc. facilities, local recreation users, and ranchers.

This evaluation looks at impacts associated with construction, operations, and maintenance of the proposed wind park, transmission tie-line, and switchyard.

Visibility Analysis

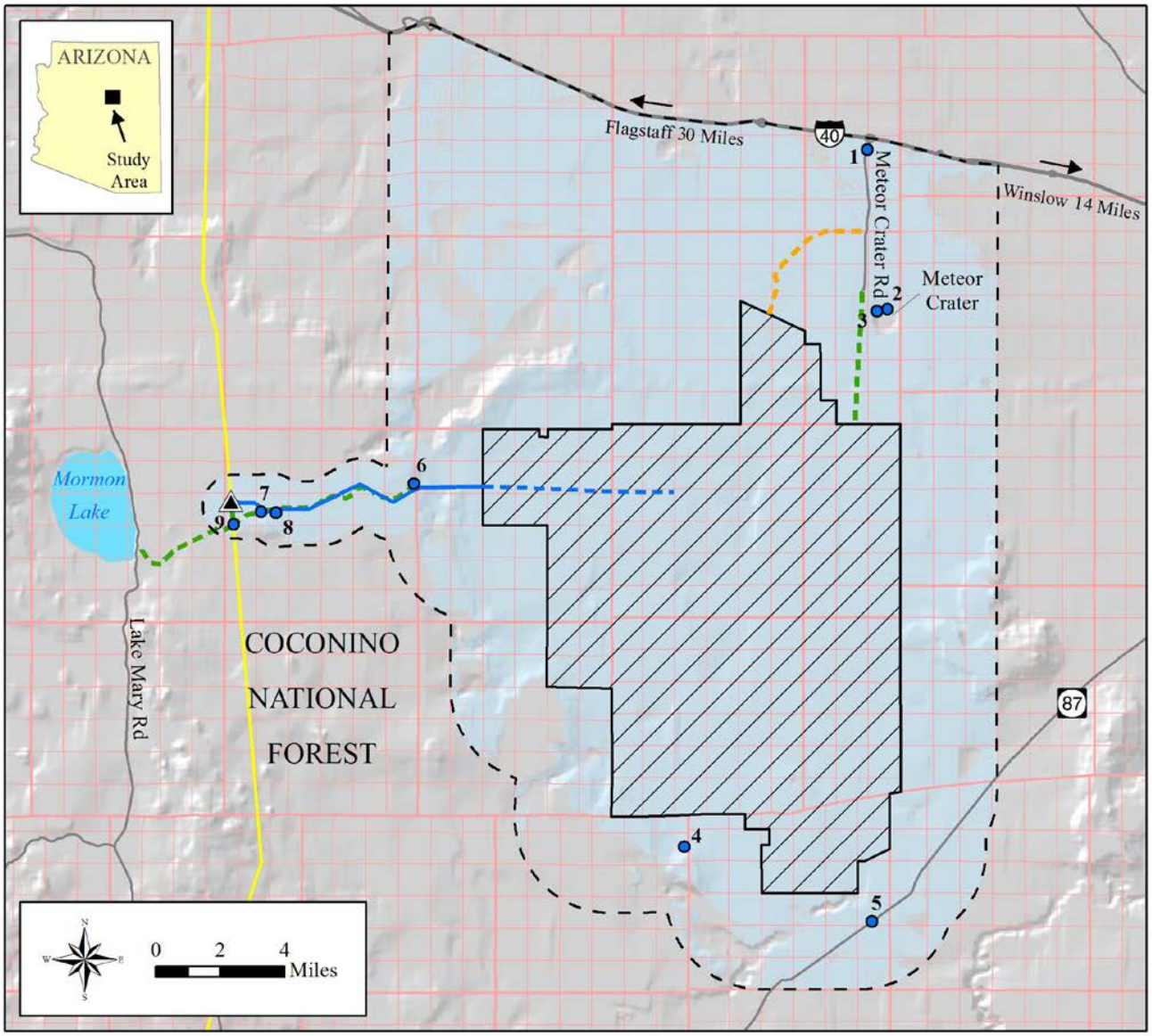
A viewshed analysis was performed using GIS technology and a 90-meter digital elevation model to determine the extent to which proposed project components would be visible from the KOPs.

Figure 3.12-7 illustrates the results of the viewshed analysis. The analysis looked only at those lands within the visual resources evaluation area. Areas depicted in light blue illustrate areas where at least a portion of the proposed project components would be visible, meaning at least one WTG or one transmission structure would be visible. The analysis does not take into account existing vegetation conditions, nor distance, which would potentially limit views.

Distance Zones

Distance plays a key role in visual analysis. As part of the VMS, the Forest Service created distance zones, which are the same under the SMS. Figure 3.12-8 depicts viewing distances from the observer's point of view. Distance zones help in the inventory and analysis process. They are divided into three main categories: foreground, middleground, and background. These three divisions are used to describe the part of a characteristic landscape that is being inventoried or evaluated. A view in which all three distances zones are visible often has the greatest scenic quality. Distance zones are defined as:

- Immediate Foreground: views extend from the viewer up to a distance of 300 feet.
- Foreground: views (within 0.5 mile) are considered to be most sensitive due to the proximity to the viewer, and the ability to perceive detail.
- Middleground: views extend from 0.5 mile to 4.0 miles from the viewer where one can perceive individual landscape features under clear conditions, but not in great detail.
- Background: views extend beyond 4.0 miles and generally consist of viewing conditions where only broad landforms are discernable and where atmospheric conditions may render the landscape an overall bluish color. In general, the farther away from the project the viewer is, the smaller the impact.



Legend

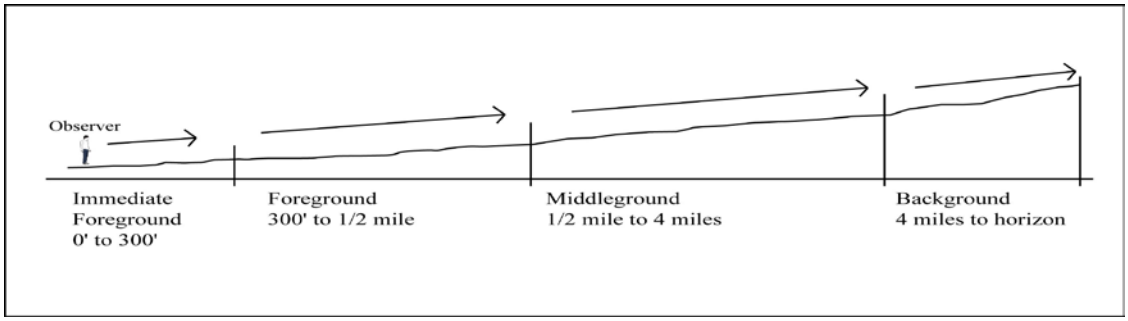
- Visual Resource Evaluation Area
- Wind Park Study Area
- Proposed 345-kV Tie-line Alignment
- Proposed 345-kV Tie-line Alignment (Alignment to Be Determined)
- Proposed New Site Access Road
- Existing Site Access Road
- Proposed Interconnection Switchyard
- Existing Western 345-kV Transmission Lines
- Areas from which a portion of the project can be seen
- Key Observation Points

Project Visibility

Grapevine Canyon Wind Project

FIGURE 3.12-7

FIGURE 3.12-8
DISTANCE ZONES ILLUSTRATION



Source: Forest Service 1995b

3.12.2.2 Foresight's Proposed Project and Proposed Federal Actions

The Forest Service manages for visual resources and has established VQOs for all lands within the visual resources evaluation area under its jurisdiction. In addition, Coconino County has established policies pertaining to private and State trust lands to protect specific views from the effects of utility infrastructure projects. Regardless of land ownership or jurisdiction, the visual resource evaluation involved using the SMS to compare the expected visual change in the existing setting as observed at each of the KOPs. Specifically, the evaluation examined the contrast the proposed wind park, proposed transmission tie-line, and Western's switchyard would have on the existing landscape design elements of form, line, color, and texture. Current and potential VQO status is evaluated for KOPs on Forest Service-managed lands.

As part of the evaluation, photographic simulations were created to depict the expected view from each KOP. Vegetation is portrayed in most of the simulations. However, simulations prepared from KOPs located on Forest Service-managed lands were developed with and without vegetation. This was because vegetation is considered ephemeral, meaning that it may or may not be there in coming years. Photographic simulations from each KOP are included in Attachment A.

Wind Park (as viewed from private and State trust lands)

KOP 1 – Interstate-40

Views of the proposed wind park from this viewpoint would be brief and fleeting, limited by distance and topography. The proposed wind park would be the only proposed project component visible from this location. The proposed wind park would be located within background views and visible elements would include multiple straight, vertical lines. These vertical landscape elements would contrast with the gentle rolling hills that are visible in foreground views. In addition, movement created by the rotation of the blades attached to each turbine would further draw the viewer's attention. Distance to the proposed wind park would be more than five miles from this location and minimizes the visual contrast resulting in a minimal impact. Views towards the San Francisco Peaks and Anderson Mesa would not be obstructed by the proposed wind park from this location. Two simulations of the proposed wind park have been prepared from this viewpoint, one depicting a 500 MW wind park and one depicting an initial phase of up to 250 MW.

KOP 2 – Meteor Crater, Patio Window

Views of the San Francisco Peaks through the framed portion of the Meteor Crater Visitor's Center Patio Window would not be obstructed by the proposed wind park. However, a portion of the proposed wind park, located within middleground views, would be visible. The majority of the proposed wind park

would be screened from view by a structure forming the Visitor Center's elevator shaft and by variations in topography forming the rim of Meteor Crater. The proposed wind park would introduce multiple vertical lines that would create a subtle contrast to the generally flat valley. The contrast would be slight in color, form and line; however, movement created by the rotation of the blades attached to each turbine would attract the viewers' focus to the presence of the WTGs. The changes that would occur from the wind park would not result in a deterioration of values on which the landmark designation is based because views of Meteor Crater itself would not change. A simulation of the proposed wind park has been prepared from this viewpoint depicting a 500 MW wind park.

KOP 3 – Meteor Crater Rim

Viewers would have a broad view of the north end of the proposed wind park from this viewpoint. A rock outcrop forming a portion of the rim of Meteor Crater would screen the southern three-quarters of the proposed wind park from view. Views of the proposed wind park would be in middle and background views. Other components of the proposed wind park would not be visible. The proposed wind park would introduce a series of tall vertical lines created by the WTGs that would stand in contrast to the generally flat valley, substantially changing the view. Movement created by the rotation of the blades attached to each turbine, as well as features of the guided tour along the crater rim, would further draw the viewers' focus to the foreign elements. The proposed wind park would create a moderate visual contrast from this viewpoint. While the wind park would change the views at middle and background distances, the WTGs are not within the Meteor Crater boundaries and do not change the geologic features of the site. In addition, the WTGs locations and distance from the Meteor Crater are such that they would not be noticeable in the foreground views. Views of the WTGs would not significantly impact the visitor's experience because the visitor's focus is on the crater itself and its history and geology. While visitors may enjoy the middle and background views from the site, those are not the primary features of the site. Two simulations of the proposed wind park have been prepared from this viewpoint, one depicting a 500 MW wind park and one depicting an initial phase of up to 250 MW.

KOP 4 – Chavez Pass

Views of the proposed wind park along this section of road are expansive to the north and east. Views of the proposed wind park would be in middle and background views, and other components of the proposed project would not be visible. The proposed wind park would introduce a high number of vertical lines that would stand in contrast to the rolling topography of the valley, partially blocking distant background views. This would result in a moderate to high visual contrast from this viewpoint. A simulation of the proposed wind park has been prepared from this viewpoint depicting a 500 MW wind park.

KOP 5 – State Route 87

Views of the proposed wind park would be apparent to motorists along this portion of SR 87. Views of the WTGs would be in the middle and background views. Other components of the proposed project would not be visible. The proposed wind park would introduce a number of vertical structures, standing in contrast to the natural setting in scale, form, line, and color. Movement created by the rotation of the turbine blades would further enhance this contrast and draw the viewer's attention. The more distant the WTGs, the less evident the contrast, as vegetation and topography further screen these structures. Views of the San Francisco Peaks would be partially blocked by some of the closest WTGs. The proposed wind park would create a high visual contrast from this viewpoint; however, the nearest WTG would be located more than one mile from the highway in accordance with current County goals and policies. Two simulations of the proposed wind park have been prepared from this viewpoint, one depicting a 500 MW wind park and one an initial phase of up to 250 MW.

Based on the visual evaluation for the proposed wind park, the proposed wind park would not conflict with current County goals and policies and all WTGs would be located greater than one mile from major travel corridors. Therefore, the proposed wind park would not cause significant impacts to visual resources.

Wind Park (as viewed from Coconino National Forest)

KOP 6 – Forest Service Road 125

This view is different from the other KOPs because it is elevated above the valley and both the proposed wind park and proposed transmission tie-line would be clearly visible within the viewshed. The proposed transmission tie-line is visible within foreground views, and the proposed wind park and transmission tie-line are visible in middleground and background views from this viewing location. The proposed wind park and transmission tie-line would introduce elements of form, line, scale, and color that would contrast with the otherwise natural valley floor. In addition, movement created by the rotating blades of the wind turbines would further attract attention. Although views along this travel corridor would be sporadic due to topographical variations and screening from vegetation, the proposed wind park and transmission tie-line would result in a moderate contrast. However, since the current VQO is Modification, the addition of the proposed wind park and transmission tie-line would not change the VQO. A simulation of the proposed wind park and transmission tie-line has been prepared from this viewpoint depicting a 500 MW wind park.

Transmission Tie-line

KOP 7 – Forest Service Road 125/Forest Service Road 82

Views of the proposed transmission tie-line would be evident to travelers as the line crosses from the south side of FS 125 to the north side. The proposed transmission tie-line would be located within foreground and middleground views. The proposed wind park and Western's proposed switchyard would not be visible from this viewpoint. The elements of the proposed transmission tie-line would create contrast in form, line, scale, and color. The visual contrast created would be moderate from this location. Two simulations of the proposed transmission tie-line have been prepared from this viewpoint, one with vegetation and one without vegetation. The proposed transmission tie-line would not meet the current VQO of Partial Retention at this site and would result in a movement down one level to a VQO of Modification.

KOP 8 – Forest Service Road 82

The proposed transmission tie-line would be visible in immediate foreground, foreground, and middleground views. The proposed wind park and Western's proposed switchyard would not be visible from this viewpoint. Transmission tie-line structures would be evident in great detail because of their proximity to the viewer. The structures would introduce elements of scale, form, line, color, and texture that would create a moderate contrast to the existing landscape. In addition, the transmission tie-line would partially interfere with views towards the San Francisco Peaks. Two simulations of the proposed transmission tie-line have been prepared from this viewpoint, one with vegetation and one without vegetation. The proposed transmission tie-line would not meet the VQO of Partial Retention at this site and would result in a movement down one level to a VQO of Modification.

Impacts associated with the construction and operation of the step-up substations would have no significant impact on the visual resources of the area. There are no state trust or private land management objectives pertaining to the aesthetics of the area. The remote location of the step-up substations reduces the number of persons who might view this infrastructure. The approximately seven-mile-long extension

tie-line required by these facilities has the same attributes, limited number of viewers and no management goals or policies for its area, constraining its impact on visual resources.

Western's Switchyard

KOP 9 – Forest Service Road 125/Western Electrical Transmission Line Corridor

Views of Western's proposed switchyard and the proposed transmission tie-line would be visible in middleground views from this viewing location. The proposed wind park would not be visible. In addition to the existing electrical transmission line structures, the proposed switchyard and transmission tie-line would introduce new structures into the viewshed adding further contrast in form, line, and color. The visual contrast created by the proposed switchyard and transmission tie-line would be low from this viewing location, because new facilities would be similar to existing man-made modifications. The proposed switchyard and transmission tie-line are located outside of the viewshed managed for Partial Retention and would not affect this VQO. Two simulations of the proposed switchyard and transmission tie-line have been prepared from this viewpoint, one with vegetation and one without vegetation.

Temporary Impacts

Short term impacts would result from construction activities. A visual impact not isolated to the visual resources evaluation area could be attributed to construction equipment in transit. Large numbers of construction vehicles carrying turbines and other construction materials would be evident to commuters and other regular highway drivers. Though periodic rather than constant, construction traffic would be seen primarily by others in transit. These impacts are considered temporary and minimal.

Disturbances in vegetation would be evident for the WTG foundations, batch plant operation area, staging areas, and road development. Changes to the soil color and a reduction of the understory vegetation would be evident especially to viewers that would have an elevated view of the proposed project components. In the long-term, some of those disturbances would be softened as the understory vegetation grows back or is otherwise restored.

Construction related impacts are anticipated to be moderate but temporary, and would occur over a 12- to 18-month timeframe for each 250 MW phase. During construction of the proposed 500 MW wind park, transmission tie-line, and Western's switchyard, approximately 2,419 to 2,630 acres of land would be altered which would temporarily interfere with the existing visual quality of the site. To minimize visual impacts, both during and after construction, RPMs as outlined in Section 2.7 would be implemented.

Light and Glare

Under FAA guidelines, lighting is required on the WTGs for aircraft safety. The required lighting would be a new visual element introduced to the area's landscape. The lights would be most noticeable during night-time hours. Additionally, security lighting would be required at Western's switchyard and the proposed step-up substations and O&M facility. All project-related lighting would be limited to what is specifically required as outlined in the RPMs (Section 2.7 under Visual Resources), including keeping exterior lighting on the turbines required by the FAA to the minimum number and intensity required to meet FAA standards. With this measure, the proposed wind park would be consistent with the current County goals, and policies and significance standards listed in Section 3.12.2.1 would not be exceeded.

Impacts associated with glare from the proposed WTGs would be minimal. Variables to consider include the amount of sunshine and the time of day. The turbines and transmission tie-line towers would create minimal glare under the correct conditions; however, this would be minimized to the extent possible by the use of non-reflective paint as outlined in the RPMs (Section 2.7).

3.12.2.3 Alternative Transmission Tie-line Corridor

The alternative transmission tie-line would create less of a visual impact than the proposed transmission tie-line because it would not be located within VQO Partial Retention areas on National Forest System lands, and would be located farther away from the intersection of FS 125 and FS 82. Therefore, the alternative transmission tie-line would not alter the VQOs prescribed by the Forest Plan. KOPs 7 and 8 are located in the vicinity of the alternative transmission tie-line. Two simulations from each of these KOPs have been prepared depicting the alternative transmission tie-line, one with vegetation and one without vegetation. The photographic simulations are included in Attachment A.

3.12.2.4 No Action Alternative

No direct or indirect impacts on existing visual resources would result through implementation of the No Action Alternative. Under this alternative, Western would not approve an interconnection for the Grapevine Canyon Wind Project, and the Forest Service would not issue a permit for the transmission tie-line proposed for the wind park. The proposed wind park, transmission tie-line, and switchyard would not be constructed and visual resources would remain unchanged.

3.13 UNAVOIDABLE ADVERSE IMPACTS

Pursuant to NEPA regulations (40 CFR 1502.1) an EIS must consider adverse environmental effects that cannot be avoided. Unavoidable impacts are those that would occur after implementation of all Foresight and agency RPMs and other recommended mitigation measures. Unavoidable impacts do not include temporary or permanent impacts that would be mitigated. They also do not include impacts from speculative events such as hazardous waste spills that are not cleaned up promptly in accordance with accepted mitigating measures.

The preliminary layout plan was prepared to avoid or reduce impacts on resources. However, construction, operation, and maintenance of the proposed project would result in unavoidable adverse impacts to biological resources, cultural resources, and visual resources within the project study area, as described below. A Biological Assessment (BA) is being prepared under Section 7 of the ESA for Federally-listed species. The BA would be used to support a determination on whether or not the proposed Federal actions would adversely affect Federally-listed species. If Western determines that the proposed Federal actions could adversely affect listed species, Western and USFWS would enter into formal consultation. Under formal consultation, the USFWS would issue a Biological Opinion with conditions and reasonable prudent alternatives to minimize adverse effects. If required, the findings of the Biological Opinion would be summarized in the Records of Decision issued by Western and the Forest Service. Conditions identified in the Biological Opinion would be followed by Western, the Forest Service, and Foresight.

3.13.1 Wind Park

Construction and operation of the proposed wind park would lead to the loss of some biological resources. Native vegetation and wildlife habitat would be removed in order to accommodate the proposed facilities. Any avian and bat mortalities caused by the operation of the wind park would be an unavoidable adverse impact. Any avian and bat mortalities would be addressed by Foresight pursuant to its Avian and Bat Protection Plan.

Any unavoidable adverse impacts to cultural resources cannot be determined until the results of the Class III Survey and Traditional Cultural Properties Survey are completed. A PA has been developed among Western, Forest Service, SHPO, affected Federal and State agencies, Foresight, and all interested Native American Tribes in conjunction with preparation of the EIS to ensure that Section 106 requirements are

met. The preferred mitigation measure is to avoid identified sites; however, the PA would define a process for addressing any cultural resource sites eligible for or on the NRHP that cannot be avoided during the construction of the wind park.

The construction and operation of the wind park, especially the introduction of the WTGs, would permanently change the visual landscape of the area by introducing broad visual contrast to the natural landscape. The visual change would vary by individual and perspective, but would generally be apparent in all directions, extending for several miles beyond the wind park.

3.13.2 Transmission Tie-line and Switchyard

Unavoidable adverse impacts to biological resources, cultural resources, and visual resources as a result of construction and operation of the proposed transmission tie-line and switchyard would be similar to those described under the wind park. The PA would address a process for addressing any cultural resource sites eligible for or on the NRHP that cannot be avoided during the construction of the proposed transmission tie-line and switchyard.

3.14 SHORT-TERM USE AND LONG-TERM PRODUCTIVITY

Pursuant to NEPA regulations (40 CFR 1502.16), an EIS must consider the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity. The impacts and use of resources associated with the proposed project are described in resource sections in this chapter.

The proposed project includes up to 333 WTGs, capable of generating a combined capacity of up to 500 MW of renewable electric power. Electricity generated in this manner results in minimal emissions of pollutants or greenhouse gases to the atmosphere. The anticipated electrical output of the proposed wind park would be collected at the step-up substations, transmitted along the proposed 345-kV transmission tie-line, and connected to the regional grid at the proposed switchyard.

The relationship between the short-term uses of the environment and the maintenance and enhancement of long-term productivity with regard to the proposed project considers the use of the wind to generate electricity and the use of the land and airspace to locate the wind generating facility. The use of the land and airspace to construct and operate a wind generating facility considers its "footprint." Development of the proposed project would require commitments of resources such as soil, water, vegetation, wildlife populations and habitats, noise, visual resources, and land use for the life of the proposed project. Impacts to transportation resources and social and economic resources would occur primarily during construction. Revenue would likely increase for some local businesses, such as construction suppliers, hotels, restaurants, gas stations, and grocery stores in response to the needs of workers associated with constructing the proposed project.

Construction and operation of the proposed wind park would convert approximately 591 acres of ranchland to utility-related uses for the life of the project, which is estimated for a period of 20 years unless landowner lease agreements are renewed. However, the proposed wind park would result in few changes to existing agricultural practices because grazing would continue in and around the WTGs and other proposed project facilities. As a result, there would be minimal effects on the overall grazing capacity of the area.

Construction and operation of the proposed transmission tie-line and switchyard would convert between 8 and 11 acres of private and State trust land and between 26 and 29 acres of Forest Service-managed lands to utility-related uses within the proposed right-of-way. The alternative transmission tie-line would also

convert between 8 and 11 acres of private and State trust lands, but would convert between 27 and 30 acres of Forest Service-managed lands to utility-related uses within the proposed rights-of-way. Existing uses of these lands, including ranching activities and dispersed recreation, would be allowed to continue around the transmission tie-line structures and the switchyard; thus, the short-term use for the proposed project would not affect the long-term productivity of the area's grazing and recreational resources.

Compared to other energy types consumed by users in Arizona and other southwestern U.S. states, wind energy makes up a very small fraction the region's total energy consumption. Energy generated by the wind could displace energy generated from other nonrenewable sources (i.e., fossil fuels) that have associated environmental and public health issues, namely air emissions, greenhouse gas generation, fossil fuel extraction, transportation, and spent fuel storage and disposal.

The wind is used as the energy source to move the turbines that generate electricity. Unlike non-renewable sources, wind turbines do not deplete their energy source; energy generation is continuous and dependent on the flow of wind. Based on this fundamental dynamic of wind energy, the long-term productivity, in this case the generation of electricity, would be maintained because of the renewable nature of wind power. While the short-term use of the land to construct and operate the wind facility would displace other uses of the area (i.e., grazing, wildlife habitat, dispersed recreational uses), there would be benefits to long-term productivity associated with the use of less than 800 acres of private, State trust, and Forest Service-managed lands to generate and transport wind energy. Long-term reductions in the region's reliance on nonrenewable energy sources and air emissions balance the short-term loss of use of this land for ranching, wildlife habitat, dispersed recreation, and other possible uses of the project study area.

If the proposed project is decommissioned, the facilities could be removed and the area of disturbance could be reclaimed. If this were to occur, it would restore the long-term productivity of the land for ranching, wildlife habitat, and dispersed recreation.

3.15 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

NEPA regulations (40 CFR 1502.16) dictate that an EIS must consider irreversible or irretrievable commitments of resources. An irreversible commitment of a resource is one that, once committed to the proposed project, would continue to be committed throughout the life of the project and would result in a loss of future options. An irretrievable commitment of resources refers to those resources that, once used, consumed, destroyed, or degraded during construction, operation, or decommissioning of the proposed project, would cause the resource to be unavailable for use by future generations. Irretrievable commitment of resources applies to loss of nonrenewable resources such as minerals or cultural resources.

The construction and operation of the proposed wind park, transmission tie-line, and switchyard on Federal, State, and private lands would change the use of directly- and indirectly-affected parcels for the life of the project. Use of natural resources that ordinarily occur in the area would be limited by the dedicated use of the area for wind energy development. Consequently, some loss of production of certain resources such as forage for livestock and wildlife would occur during the time that those lands are out of production. However, because the turbines and other components of the facility could be removed, and the land restored to pre-construction conditions, the commitment of the land would not result in long-term irreversible or irretrievable commitment of resources.

The loss of soil productivity associated with the WTG pads, transmission tie-line structures, and access roads would result in an irreversible commitment of resources. This loss of productivity could be

minimized after restoration and revegetation, but this could take a substantial amount of time because of the arid nature of the project study area.

Operation of the wind farm would likely result in some avian and bat mortalities, which would constitute an irretrievable loss of these individuals.

Cultural resources such as prehistoric sites, historic properties, and cultural landscapes are non-renewable resources. Inadvertent or accidental destruction of cultural resources during construction that might occur despite mitigation actions would be an irretrievable commitment of resources. The preferred mitigation measure is to avoid identified sites; however, the PA would define a process for addressing any cultural resource sites eligible for or on the NRHP that cannot be avoided during the construction of the wind park, transmission tie-line, and switchyard, or discovered during foundation excavations.

Beyond the natural and cultural resource commitments, there have been financial resources already expended by the project proponent, Western, and the Forest Service for the planning and review of the proposed project. The expenditure of funds would continue throughout the permitting and construction phases of the project should the project be approved (e.g., for permitting, site plan approval, building and construction inspections; for research and monitoring programs; and for the large investment in WTGs, transmission tie-line components, the switchyard, and other associated infrastructure). Such financial resources would not be available for other uses.

An undeterminable amount of energy would be spent on fabrication of the components for the proposed project which would be offset by energy produced by the proposed project. An example would be the energy required to manufacture the WTG towers and blades and the transmission tie-line structures. The proposed project would also result in unknown offsets from other energy development, providing electrical power that would otherwise have to be generated by another generation facility (possibly using non-renewable resources) at another location.

While many of the components of the proposed project could be recycled following decommissioning, particularly the metal components, there would be an irretrievable commitment of some non-recyclable building materials (gravel and cement) and fuel for construction equipment.

The life of the proposed wind park is expected to be 20 years or more, and the wind park owner could elect to renew the land leases at the end of the contracted agreements. The decision to renew the leases versus decommissioning of the facility would be made at that time and would be based on power market conditions and future contracts for sale of electricity from the wind generating facility. Depending on current wind turbine technology, at the end of the lease period, the WTGs could be updated with more efficient components, thereby extending the service life of the proposed wind park. If the WTGs are not upgraded and upon termination of operations, the wind park owner would have the obligation to decommission the facility and perform reclamation as required by the landowners and appropriate land management agencies or jurisdictional authorities.