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Chapter 2.0
Description of Alternatives

2.1 Introduction

CEQ regulations for implementing NEPA require that federal agencies explore and objectively evaluate reasonable alternatives to the proposed action, and briefly discuss the rationale for eliminating any alternatives that were not considered in detail. Therefore, in Section 2.1, we discuss the factors we considered when developing alternatives. In Section 2.2, we describe a range of reasonable alternatives, including the Proposed Alternative, the No Action Alternative, and two other action alternatives. In Section 2.3, we summarize and compare the alternatives considered for detailed analysis, and in Section 2.4, we discuss alternatives that were considered but eliminated from further study.

In developing alternatives, we considered, among other factors, the criteria that we would use to screen alternatives; our management of eagles and other bird species; adherence to ECP guidance and compliance with BGEPA; and input from the public, agencies, and tribes. These factors are presented below.

2.1.1 Alternatives Screening Criteria

Throughout 2014, we held several internal meetings to discuss alternatives and developed these screening criteria for the alternatives that would be considered in full:

- Meet the purpose and need
    - Be consistent with BGEPA regulatory standards
    - Endeavor to follow Secretarial Order 3285, which encourages development of renewable energy generation projects in the United States while protecting and enhancing the Nation's water, wildlife, and other natural resources
- Pose a clear choice for the decision maker
- Be reasonable
    - Be consistent with laws and regulations
    - Be technically feasible (that is, would use commercially available technology)
    - Be economically feasible (that is, would result in a reasonable rate of return for investment)
    - Be implementable by the project proponent
    - Represent an action for which we could issue ETPs

2.1.2 Focus of EIS

While developing alternatives, we considered the potential direct and indirect effects on eagles of the proposed project activities that would be covered by the ETPs. This approach is consistent with 40 CFR 1500.1, the purpose of NEPA, which states that "NEPA documents must concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail."

Our impacts assessment process is based on our Final EA for the eagle take permit rule (USFWS 2009). Before issuing an eagle take permit, we must analyze eagle populations at several levels. First we look at populations in the eagle management unit (EMU) for each species. Then we analyze the local area population (LAP) and further consider the impacts of a project on both bald and golden eagles. The geographic units we use and their relevancy to alternatives development are described in the following sections.

2.1.2.1 Eagle Management Units

We defined EMUs in our Final EA for the eagle take permit rule (USFWS 2009) by using available data for bald and golden eagles to identify regional eagle population management areas for each species. Our goal was to ensure that our permit program does not cause declines in eagle populations at a regional or national scale (USFWS 2009). For bald eagles, EMUs largely follow USFWS regional boundaries. The EMUs for bald eagles potentially affected by the CCSM Phase I Project are the Northern Rocky Mountains EMU and the Rocky Mountains and Plains EMU. The EMUs for bald eagles are shown in Figure 2-1. For golden eagles, EMUs follow Bird Conservation Regions (BCRs). The EMUs for golden eagles potentially affected by the CCSM Phase I Project are BCRs 10, 16, 17, and 18, as shown in Figure 2-2 and discussed in Section 2.1.2.2 (USFWS 2013b).

Eagle take permits that exceed take thresholds for the affected regional EMU, either singly or in combination with other analyzed forms of take, must require that the eagle take be offset so that there is no net loss to the breeding population. This compensatory mitigation is further described in Section 2.2.1.4.5.

2.1.2.2 Bird Conservation Regions

BCRs are ecologically distinct regions in North America with similar bird communities, habitats, and resource management issues established by the North American Bird Conservation Initiative (U.S. NABCI Committee 2015). We use BCRs as the management unit for golden eagles in accordance with the 2009 Eagle Permit Rule (74 FR 46836-46879).

Eagles in each of four BCRs may migrate to or from the Phase I development and infrastructure areas. That is, eagles potentially affected by the CCSM Phase I Project can be part of any of the four BCR eagle populations. The four BCRs are described below and are shown in Figure 2-2:

- BCR 10, Northern Rockies: This BCR includes the Northern Rocky Mountains and outlying ranges in both the United States and Canada. Although the mountainous portions of this BCR are dominated by a variety of coniferous forest habitats, the BCR includes the intermontane Wyoming Basin, which is characterized by sagebrush shrubland and shrub-steppe habitat. The CCSM Phase I Project is located in the southern portion of this BCR. Golden eagles present in the northern areas of this BCR may also migrate south to the Phase I development and infrastructure areas during winter months.

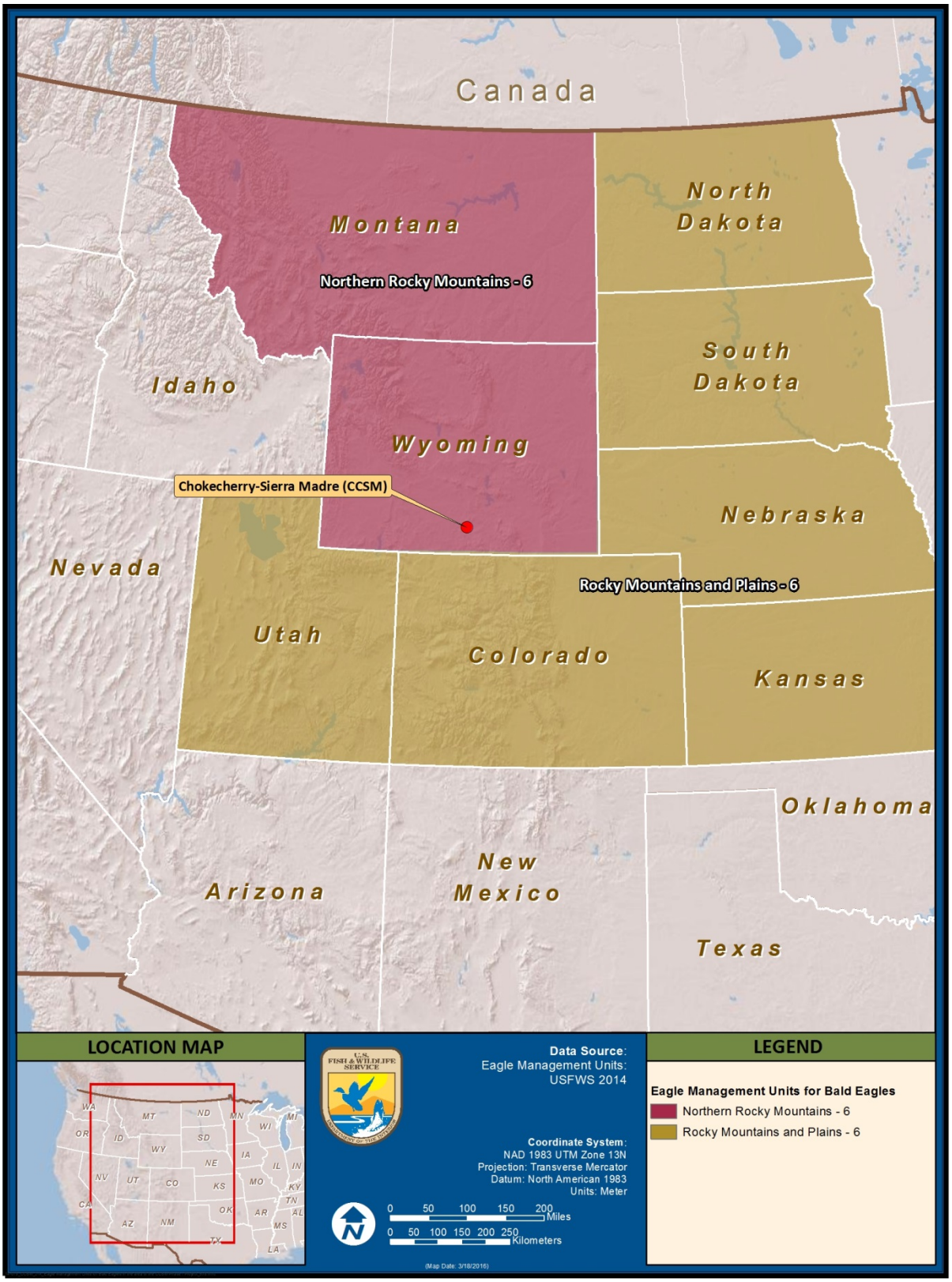

Figure 2-1. Eagle Management Units for Bald Eagles in the area of the CCSM Phase I Project in Wyoming

Figure 2-2. North American Bird Conservation Regions (BCRs) Contiguous to the CCSM Phase I Project in Wyoming

- BCR 16, Southern Rockies/Colorado Plateau: This BCR is topographically complex and includes the Wasatch and Uinta Mountains to the west and the Southern Rocky Mountains to the east, separated by the tableland of the Colorado Plateau. A range of habitats is contained in this BCR, including coniferous forest interspersed with aspen at higher elevations, piñon-juniper woodlands on lower plateaus, and shortgrass prairies in the high arid plains. Golden eagles from this BCR may migrate north to the Phase I development and infrastructure areas during summer months.
- BCR 17, Badlands and Prairies: This BCR is a semi-arid rolling plain dominated by a mixed-grass prairie that lies west and south of the glaciated Prairie Pothole region, east of the Rocky Mountains, and north of the true shortgrass prairie. Many large, contiguous grassland tracts persist in this area. Golden eagles from this BCR may migrate to the Phase I development and infrastructure areas, especially during winter months.
- BCR 18, Shortgrass Prairie: This BCR lies in the rainshadow of the Rocky Mountains, where arid conditions greatly limit the stature and diversity of vegetation. Numerous broad, braided rivers drain easterly out of the Rockies and cross through the shortgrass prairie. Golden eagles from this BCR may migrate north to the Phase I development and infrastructure areas during summer months.

2.1.2.3 Local Area Population Scale

For eagles, we define LAPs. The local area is defined for each eagle species using the median natal dispersal distance, or the average distance traveled by an individual eagle from its place of birth to the place where it reproduces. For bald eagles, we conducted our analysis using a 43-mile buffer around the CCSM Phase I Project, and for golden eagles, we did this using a 140-mile buffer around the CCSM Phase I Project. These distances are based on median dispersal distance from nests as presented in the ECP guidance (USFWS 2013b). The LAP is the population of eagles within this radius. For bald eagles, the LAP analysis for the CCSM Phase I Project included the portions of the Northern Rocky Mountains EMU and the Rocky Mountains and Plains EMU that are within 43 miles of the CCSM Phase I Project. For golden eagles, the LAP analysis for the CCSM Phase I Project included the portions of each BCR within 140 miles of the CCSM Phase I Project. For the CCSM Phase I Project, this includes the southern portion of the Northern Rockies BCR (BCR 10), and portions of BCRs 16, 17, and 18. This combined area incorporates portions of three states (Wyoming, Colorado, and Utah). The local areas are shown in Chapter 4.0 in Figures 4-2, 4-3, and 4-4.

After we complete the review of the project at the regional or EMU level, we look next at the LAP scale and further consider the predicted level of eagle take for both bald and golden eagles and conduct further analyses.

2.1.2.4 Take Thresholds or Benchmarks

When considering issuing an ETP, we look at our established take thresholds, or benchmarks, which are published in our Final EA for the eagle take permit rule (USFWS 2009). To ensure that any authorized take of eagles does not exceed the BGEPA preservation standard, we have set regional take thresholds for each species. Take thresholds establish the maximum cumulative take of eagles that can be allowed under a programmatic ETP each year in each

EMU. We have determined that a take rate of 1 percent of the estimated total eagle population at the LAP scale (referred to as the 1 percent benchmark) is a level of take that would be of concern to us (USFWS 2013b). We have determined that the 5 percent benchmark (a take rate of 5 percent of the estimated eagle population at the LAP scale) is the upper end of what would be appropriate under the BGEPA preservation standard. We generally would not issue an ETP for a project that would exceed the 5 percent benchmark. These benchmarks are set to protect eagle populations at a local scale.

We first compare the CCSM Phase I Project to these benchmarks, as described below and in Chapter 3.0. As described in Chapter 4.0, we also analyze the predicted level of take from this individual project in combination with other reasonably foreseeable future actions at the LAP scale to determine the cumulative impacts on eagles. If we issue an ETP, the level of allowable take would be established for the life of the permit. If actual take from the project exceeds the allowable take in the permit, PCW would be liable for the additional take. We may build an adaptive management process into the permit within which we would review the level of actual take on an annual basis.

2.1.2.4.1 Bald Eagles

For bald eagles, we use the EMU take thresholds in our Final EA for the eagle take permit rule, Table C-3 (USFWS 2009), for the Northern Rocky Mountains EMU and the Rocky Mountains and Plains EMU. These thresholds are set at 5 percent of estimated annual production of bald eagles. As shown in the Final EA for the eagle take permit rule, in Table C-3, the combined take threshold for these two EMUs is 43.75 individual bald eagles. We calculate the predicted level of bald eagle take for the CCSM Phase I Project and determine whether it would fall within the established take threshold (below the 5 percent benchmark) for these two EMUs. Then we analyze the predicted level of take and compare it to the LAP 5 percent benchmark. For bald eagles, we have determined that the predicted level of take due to the CCSM Phase I Project would be below the 5 percent benchmark; therefore, we are considering issuing standard and programmatic ETPs for bald eagles.

2.1.2.4.2 Golden Eagles

For golden eagles, we use the take thresholds in our Final EA for the eagle take permit rule, Table C-4 (USFWS 2009), for the regional level. As shown in the Final EA for the eagle take permit rule, in Table C-4, the take threshold for golden eagles is set at zero for BCRs 10, 16, 17, and 18 (and throughout the range of the species) because data indicate that golden eagle populations are not able to sustain any additional unmitigated mortality (mortality is defined as the death of a large number of individuals) (USFWS 2009). This means that any new authorized take of golden eagles must be at least equally offset by compensatory mitigation. Compensatory mitigation is defined as specific conservation actions to replace or offset project-induced golden eagle fatalities. Therefore, in order for us to issue an ETP, PCW would be required to first perform compensatory mitigation to offset all predicted golden eagle fatalities from the CCSM Phase I Project, resulting in no net loss of golden eagles.

2.1.3 ECP Guidance

We have developed ECP guidance for wind energy developers to follow when they consult with us and apply for ETPs (USFWS 2013b). This guidance outlines the procedures that both we and wind energy developers, such as PCW, should follow during the permitting process. The guidelines were developed based on an EA that evaluated permitting eagle takes and on federal rule making (USFWS 2009; 78 FR 73704-73725).

The alternatives carried forward for detailed analysis in this EIS are consistent with the ETP process, as outlined in the following ECP guidance (USFWS 2013b):

- Under federal rules for ETPs, we can issue permits that authorize individual instances of take of bald and golden eagles, and programmatic take (that is, instances of take that may recur over time), when take is associated with, but not the purpose of, an otherwise lawful activity and cannot practicably be avoided. Wind project operators are not legally required to seek or obtain an ETP. However, the take of an eagle without a permit is in violation of BGEPA and could result in a referral by USFWS to the U.S. Department of Justice for prosecution.
- Eagle take permits may be issued only in compliance with the preservation standards of BGEPA, which currently means that the take must be consistent with the goal of stable or increasing breeding populations of eagles.
- The USFWS identified take rates of between 1 and 5 percent of the total estimated LAP as a threshold of concern, with 5 percent being the upper end of what might be appropriate under the BGEPA preservation standard, whether offset by compensatory mitigation or not.
- For programmatic ETPs, the regulations require that any authorized take must be unavoidable after the implementation of advanced conservation practices (ACPs). We have not currently approved any ACPs for wind energy projects and are working with the wind industry to develop ACPs as part of an adaptive-management regime and comprehensive research program tied to the programmatic ETP process. Therefore, any ACPs for the CCSM Phase I Project will be referred to as experimental ACPs (EACPs). These EACPs are consistent with the ECP guidance.
- Project developers are expected to implement reasonable avoidance and minimization measures that may reduce take of eagles at a project, and we would work with developers to identify site-specific and possible turbine-specific factors that may pose risks to eagles.
- Where wind energy facilities cannot avoid taking eagles and eagle populations are not healthy enough to sustain additional mortality, applicants must reduce unavoidable mortality to a no-net-loss standard for the duration of the permitted activity. No-net-loss means that these actions either reduce another existing cause of mortality to a level equal to or greater than the unavoidable mortality, or lead to an increase in carrying capacity that allows the eagle population to grow by an equal or greater amount. Actions to reduce eagle mortality or increase carrying capacity to this no-net-loss standard are known as compensatory mitigation. Examples of compensatory mitigation activities might include retrofitting power lines to reduce eagle electrocutions, removing road-killed animals that eagles scavenge for food to reduce

the number of eagles killed by vehicles, or increasing prey availability to increase the number of eagle breeding pairs.

- The issuance of a programmatic ETP and compensatory mitigation requirements are based on the proposed project's risk of eagle take. The risk of eagle take is based on predicted eagle fatalities (that is, deaths of individual eagles) for a project. Fatalities are estimated based on site-specific data collected by the applicant and fatality modeling performed by the USFWS (taking avoidance and minimization measures into account) using our peer-reviewed eagle fatality prediction model (USFWS 2013b, 2013c; New et al. 2015).

2.1.4 Public, Agency, and Tribal Input

As discussed in Section 1.8, we solicited public, agency, and tribal input through the scoping phase of the EIS and through additional consultations. Scoping meetings were held on December 16, 2013, in Rawlins, Wyoming, and on December 17, 2013, in Saratoga, Wyoming, and the scoping comment period ran from December 4, 2013, to February 3, 2014. Tribal consultation efforts have been ongoing. Through scoping and consultations, we have received comments on a range of topics and have addressed all comments that affect development of the EIS alternatives, as appropriate.

We solicited additional input on the EIS alternatives from cooperating agencies during an alternatives workshop held on September 10, 2014, in Cheyenne, Wyoming. One of the purposes of the workshop was to methodically work through all cooperating agency recommendations on a broad range of alternatives to determine which alternatives would be analyzed in full in the EIS as well as which alternatives would be dismissed from further evaluation. Another purpose of the workshop was to discuss the reason why each alternative would or would not be assessed in full in the EIS.

2.2 Alternatives Carried Forward for Detailed Analysis

After considering the input received from the public, agencies, and tribes regarding the range of alternatives to be considered in this EIS, and comparing the input to the alternatives development criteria (see Section 2.1.1) and ECP guidance (see Section 2.1.2; USFWS 2013b), we determined that four alternatives would be considered in full. These four alternatives are described in the following sections:

- Alternative 1 – Proposed Action: Issue ETPs for Phase I Wind Turbine Development and Infrastructure Components
- Alternative 2 – Proposed Action with Different Mitigation
- Alternative 3 – Issue ETPs for Only the Sierra Madre Portion of the CCSM Phase I Project
- Alternative 4 – No Action: Denial of ETPs

2.2.1 Alternative 1 – Proposed Action: Issue ETPs for Phase I Wind Turbine Development and Infrastructure Components

2.2.1.1 Overview

On June 16, 2015, we received an application from PCW for a standard ETP for disturbance take related to the construction of the Phase I wind turbine development and infrastructure components for the CCSM Phase I Project. On June 16, 2015, we also received an application from PCW for a programmatic ETP for the take of bald and golden eagles under BGEPA for operation of the CCSM Phase I Project. Along with the ETP applications, PCW submitted its ECP for the CCSM Phase I Project on June 16, 2015. The ETP applications and ECP are provided in Attachment A. On August 3, 2015, we received a Phase I Bird and Bat Conservation Strategy (BBCS) from PCW in support of its ETP applications. The Phase I BBCS is provided in Attachment B.

Alternative 1 (Proposed Action) is for the USFWS to issue two ETPs for the CCSM Phase I Project, which includes both infrastructure components and wind turbine development, based on the ETP applications. The first ETP, a standard ETP, would cover the activities that would result in the unavoidable disturbance of eagles (including nest disturbance) during the construction of the infrastructure components and Phase I wind turbine development for the CCSM Phase I Project. The second ETP, a programmatic ETP, would cover the ongoing take of eagles that is likely to occur during the operation of the CCSM Phase I Project. We have analyzed the construction and operation of the infrastructure components as part of the CCSM Phase I Project because these components would have no independent utility without the wind turbine development.

To issue the ETPs, we must determine that the CCSM Phase I Project is consistent with the BGEPA regulatory standards. These standards are currently defined as issuing permits for projects that would maintain stable or increasing breeding populations of bald and golden eagles, resulting in no net loss of eagles. In deciding whether to issue the ETPs, we would endeavor to follow Secretarial Order 3285, issued by the Secretary of the DOI in 2009, which encourages development of renewable energy generation projects in the United States while protecting and enhancing the Nation's water, wildlife, and other natural resources.

2.2.1.2 Covered Activities (Description of the CCSM Phase I Project)

The activities covered under the standard ETP for Alternative 1 would include the construction activities for the Phase I wind turbine development and the infrastructure components for the CCSM Phase I Project that may result in disturbance take of eagles. The programmatic ETP would cover the operation of the CCSM Phase I Project that is anticipated to result in eagle fatalities and other types of take, as described in Section 1.7.2.

The CCSM Phase I Project would include 500 wind turbines in the western portions of the Chokecherry and Sierra Madre WDAs, as shown in Figure 2-3. Within the Chokecherry WDA, the Phase I wind turbine development would include 202 turbines, primarily located east of WYO 71/CR 401. Within the Sierra Madre WDA, the Phase I wind turbine development would include 298 turbines in the areas occurring west of WYO 71/CR 401.

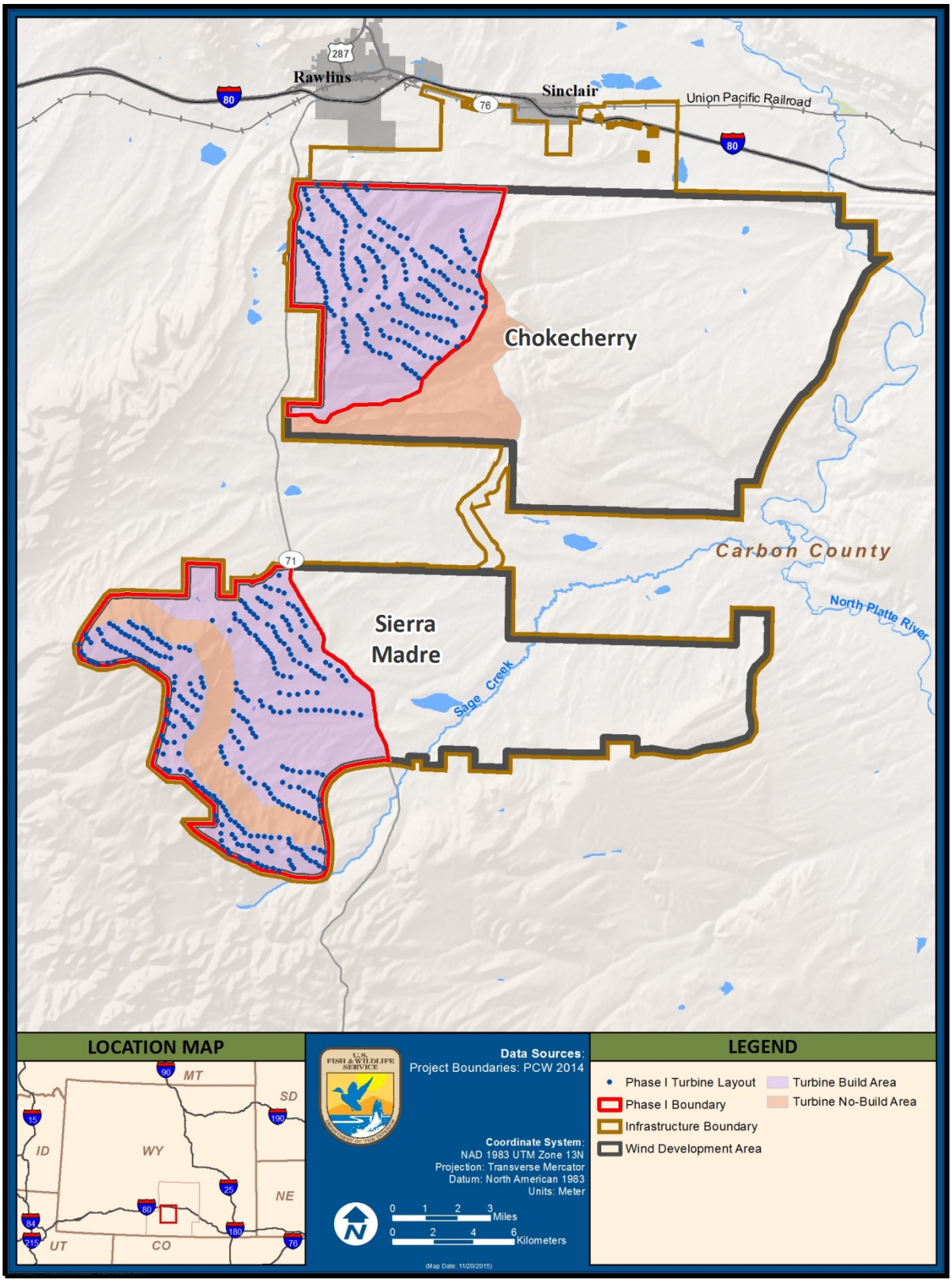

Figure 2-3. Proposed Wind Turbine Layout for the CCSM Phase I Project in Carbon County, Wyoming

Along with the turbines themselves, the Phase I wind turbine development would include roads, laydown yards (including a temporary construction camp and parking areas), electrical systems (including electrical lines and substations), water facilities, operation and maintenance buildings, meteorological towers, utilities, and other temporary features, as shown in Figures 2-4 and 2-5.

As described in the ECP, PCW would also construct infrastructure components as part of the CCSM Phase I Project. The infrastructure components that would be covered by the ETPs are the Phase I Haul Road and Facilities, West Sinclair Rail Facility, and Road Rock Quarry, shown in Figures 2-4 and 2-5. These infrastructure components would be required for construction of the Phase I wind turbine development and are summarized below:

- **Phase I Haul Road (Haul Road) and Facilities.** The Haul Road would begin at the Northern Entrance to the CCSM Project area, which is off of I-80 at Exit 221 and then south along CR 407/CIG Road. The route of the Haul Road would then move west, connecting to the West Sinclair Rail Facility, and then south through the center of the Chokecherry WDA and finally through the Sierra Madre WDA. Additional facilities associated and co-located with the Haul Road that are required for the CCSM Phase I Project would include certain arterial and facility access roads, three water stations, one water extraction facility, and five laydown yards. The North Platte River Water Extraction Facility would include the North Platte pump station, a buried water pipeline, and two booster pump stations.
- **West Sinclair Rail Facility (Rail Facility).** The West Sinclair Rail Facility would consist of a rail connection to the Union Pacific Railroad (UPRR) main line between Rawlins and Sinclair, and an associated laydown yard to receive, temporarily stage, and deliver components and construction-related materials. The Rail Facility would connect with the CCSM Phase I Project and is designed to minimize impacts on public roadways by bringing construction materials, including wind turbines, to the site by railroad. Approximately 14 miles of track would be constructed, including a wye (that is, a triangular railroad junction), a lead track, a running track, a loop track, and several unloading areas. Vehicle access to the Rail Facility would be from Interstate 80 (I-80), Exit 221, and from the Haul Road.
- **Road Rock Quarry (Quarry).** The Road Rock Quarry would be situated within the boundaries of the Chokecherry WDA at the location of an existing quarry approximately 2 miles south of Rawlins. The Quarry would provide most of the road construction material for the CCSM Phase I Project. The Quarry would decrease the number of train and truck trips required to deliver road based aggregate from off-site quarries to the CCSM Phase I Project. Activities at the Quarry would include surface rock mining and the processing of sandstone and shale. The Quarry would include the excavation area, material processing area, material storage piles, and a 5-mile-long quarry access road (Quarry Road).

We used the following description of the proposed site preparation, Phase I wind turbines, additional Phase I wind turbine development features, infrastructure components, and project schedule to assess impacts related to issuing ETPs for the CCSM Phase I Project.

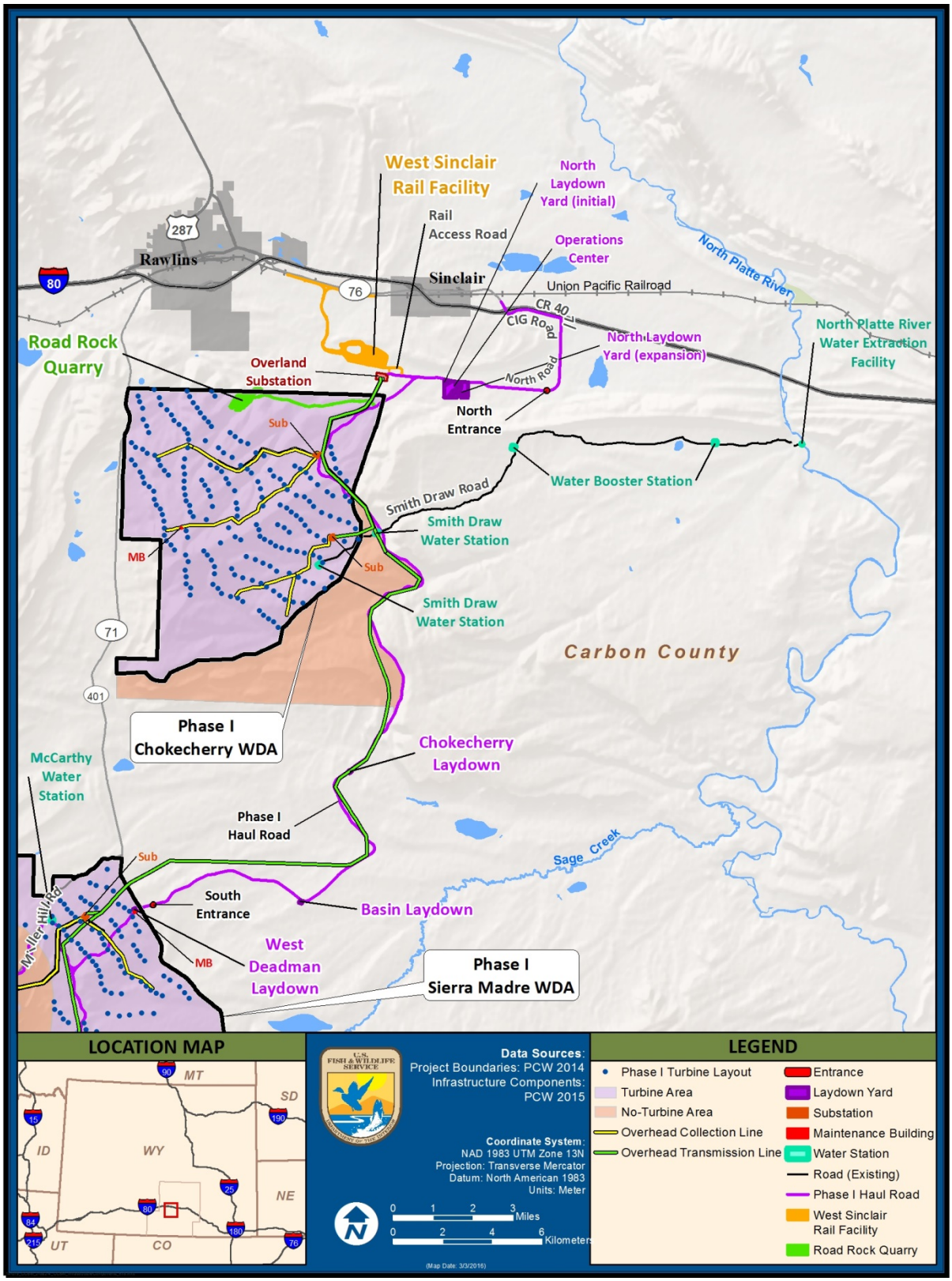

Figure 2-4. Infrastructure Components in the Chokecherry Wind Development Area for the CCSM Phase I Project in Wyoming

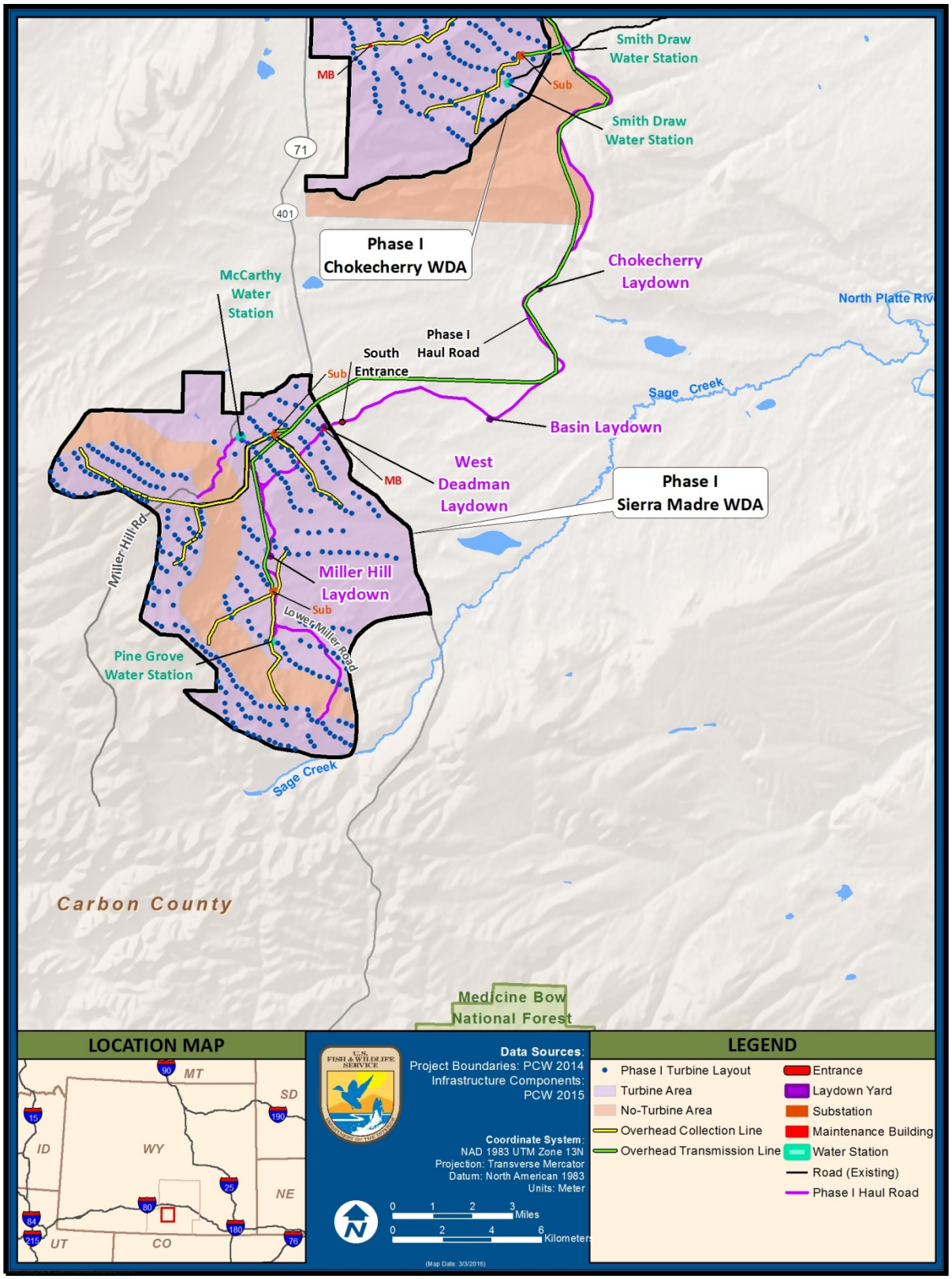

Figure 2-5. Infrastructure Components in the Sierra Madre Wind Development Area for the CCSM Phase I Project in Wyoming

2.2.1.2.1 Surface Modification

The CCSM Phase I Project would include a range of surface modification activities during construction of the wind turbines and the associated turbine infrastructure. For this analysis, we categorized surface modification by the duration of use and level of grading and vegetation cutting into three areas: initial clearing and grading areas, long-term modification areas, and "activity" areas. Initial clearing and grading areas include the total area that would be cleared for construction of the CCSM Phase I Project, including long-term modification areas and areas that would be revegetated and reclaimed following construction. Long-term modification areas include roads and pads that would be maintained throughout project operations and rehabilitated during project decommissioning. Activity areas include locations where grasses may be mowed and shrubs may be cut or partially cut for a short period during construction; no clearing or grading would occur. These areas are discussed in more detail in Section 2.2.1.2.2 under the heading "Wind Turbine Site Activities."

The CCSM Phase I Project would consist of 3,035 acres of initial clearing and grading, 485 acres of long-term modification, and 440 acres of activity areas. The infrastructure components would result in an additional 1,429 acres of initial clearing and grading and 364 acres of long-term modification. Table 2-1 shows the estimated acreages for the initial clearing and grading areas, long-term modification areas, and activity areas for the CCSM Phase I Project.

Table 2-1. Surface Modification Areas by Component for the CCSM Phase I Project in Wyoming

Project Component	Initial Clearing and Grading Area (acres) [a]	Long-Term Modification Area (acres)	Activity Area (acres)
Phase I Wind Turbine Development • Roads • Wind Turbines, Pads, Foundations • Collection System • Substations • Internal Transmission System • Buildings • Meteorological Towers • Utilities • Laydown Yards (including construction trailers and workforce accommodations [Construction Camp and RV Park] in North Laydown Yard) • Crane Assembly Areas • Crane Paths • Construction Camp and RV Park for Workforce	3,035	485	440

Project Component	Initial Clearing and Grading Area (acres) [a]	Long-Term Modification Area (acres)	Activity Area (acres)
Phase I Haul Road and Facilities • Haul Road (40.5 miles new; 1.9 miles improved public road) • Laydown Yards (North, Chokecherry, Basin, West Deadman, Miller Hill) • Water Stations (Smith Draw, McCarthy, Pine Grove) • North Platte River Extraction Facility (including North Platte Pump Station, buried water pipeline, and two booster pump stations)	875	225	0
West Sinclair Rail Facility • Rail Access Road • Rail Laydown Yards and Facilities • Union Pacific Main Line Connection and Running Track • Wye Junction and Lead Track • Wind Turbine Unloading Tracks • Manifest Unloading Tracks • Bad Order and Locomotive Storage Tracks	370	121	0
Road Rock Quarry • Quarry Road • Material Extraction Area (or Excavation Area) • Northern Operations Area • Southern Operations Area • Soil Storage and Erosion Control Areas	184	18	0
Total	**4,464**	**849**	**440**

Note:
[a] The initial clearing and grading area includes the long-term modification area.

Table 2-2 shows the breakdown of the estimated acreages for the initial clearing and grading areas, long-term modification areas, and activity areas of Phase I wind turbine development by location within the respective WDA.

Table 2-2. Wind Turbine Development Surface Modification Areas for the CCSM Phase I Project in Wyoming

Region	Initial Clearing and Grading Area (acres)	Long-Term Modification Area (acres)	Activity Area (acres)
Chokecherry WDA			
Nevins Valley	671	108	110
Smith Draw	591	95	68
Chokecherry Total	**1,262**	**203**	**177**
Sierra Madre WDA			
McCarthy	392	66	113
Pine Grove	433	60	60
Upper Miller Hill	725	115	72
Sierra Madre Total	**1,550**	**241**	**245**
Infrastructure areas within the Chokecherry and Sierra Madre WDAs			
Northern (including operations center)	183	38	3
Basin	40	3	15
Infrastructure Area Total	**223**	**41**	**18**
Total	**3,035**	**485**	**440**

Long-term modification areas would occur within initial clearing and grading areas and include areas where aggregate fill material would be placed for wind turbine sites, roads, laydown yards, and other sites that would be used during project operation. About 1.5 million cubic yards (CY) of aggregate would be required to build the CCSM Phase I Project, with about 674,000 CY of that aggregate used for the Phase I wind turbine development. The aggregate would be obtained both from the proposed Road Rock Quarry onsite and from nearby commercial sources. A small amount of aggregate would also be required to operate and maintain the CCSM Phase I Project. Aggregate would be removed as part of the decommissioning process.

An estimate of the primary materials and components that would be required for construction of the Phase I wind turbine development and infrastructure components for the CCSM Phase I Project is provided in Table 2-3.

Table 2-3. Construction Materials and Components by Year for the CCSM Phase I Project in Wyoming

Material	2015	2016	2017	2018	Total
Wind Turbine Components					
Nacelles	0	0	229	271	**500**
Hubs	0	0	229	271	**500**
Tower sections	0	0	916	1,084	**2,000**
Blades	0	0	687	813	**1,500**
Total Components	**0**	**0**	**2,061**	**2,439**	**4,500**
Aggregate					
From Road Rock Quarry (CY)	0	442,000	273,000	152,000	**867,000**
From Outside Quarry (CY)	0	187,800	288,000	151,300	**627,100**
Total Aggregate (CY)	**0**	**629,800**	**561,000**	**303,300**	**1,494,100**
Construction Components and Materials					
Corrugated Metal Pipe Culverts	0	180	178	137	**495**
Rebar (tons)	0	9,420	13,860	6,720	**30,000**
Cable Reels	0	0	1,170	1,440	**2,610**
Overhead Collection Structures	0	0	285	243	**528**
Internal Transmission					
Structures	0	0	177	38	**215**

2.2.1.2.2 Phase I Wind Turbines

The CCSM Phase I Project would involve the installation of 500 wind turbines. The Chokecherry WDA would contain 202 turbines, and the Sierra Madre WDA would contain 298 turbines. The number of turbines proposed for each WDA is presented in Table 2-4, and the proposed placement of wind turbines is shown in Figure 2-3.

Table 2-4. Wind Turbine Development Areas for the CCSM Phase I Project in Wyoming

Wind Development Area/Region	Number of Turbines
Chokecherry WDA	**202**
Nevins Valley[a]	112
Smith Draw[a]	90
Sierra Madre WDA	**298**
McCarthy[b]	69
Pine Grove[b]	72
Upper Miller Hill	157
Total	**500**

Notes:

[a] Collectively referred to as Nevins Ridge

[b] Collectively referred to as Lower Miller Hill

PCW determined the preliminary site for each wind turbine based on meteorological, topographical, and geotechnical data, and field review of the preliminary layout. PCW further refined the sites of the individual wind turbines based on conditions outlined in the BLM ROD, consultation with us and the BLM, and site-specific characteristics (PCW 2014a). Additional information on siting and refining the locations of the wind turbines to avoid and minimize impacts on eagles and other wildlife is provided in Section 2.2.1.3.2, below.

As shown in Figure 2-6, each wind turbine would consist of a nacelle, hub, tower, rotor, and blades. Wind turbines are not specifically designed for each project. Rather, wind turbines are designed according to industry standards to meet a range of wind and site conditions. For utility-scale wind turbines such as those required for the CCSM Phase I Project, vendors would review the site-specific wind data and offer models that meet the requirements of the observed and predicted wind conditions. The wind turbine options for the CCSM Phase I Project are still under consideration. However, all turbine models under consideration have the same general configuration shown in Figure 2-6. This configuration is a single-rotor, three-bladed upwind horizontal-axis design on a tubular tower. The tower would be fixed to a foundation. All turbine models under consideration for the CCSM Phase I Project have a maximum tower height of 328 feet (100 meters) from ground level to the turbine hub, and a maximum rotor diameter of 394 feet (120 meters). Although these dimensions represent the largest turbine under consideration, towers currently being evaluated by PCW range in height from 262 to 279 feet (80 to 85 meters) with rotor diameters of 331 to 367 feet (101 to 112 meters). Any wind turbine model selected by PCW would be painted the standard manufacturer color (approximately 5 percent grey) unless otherwise specified.

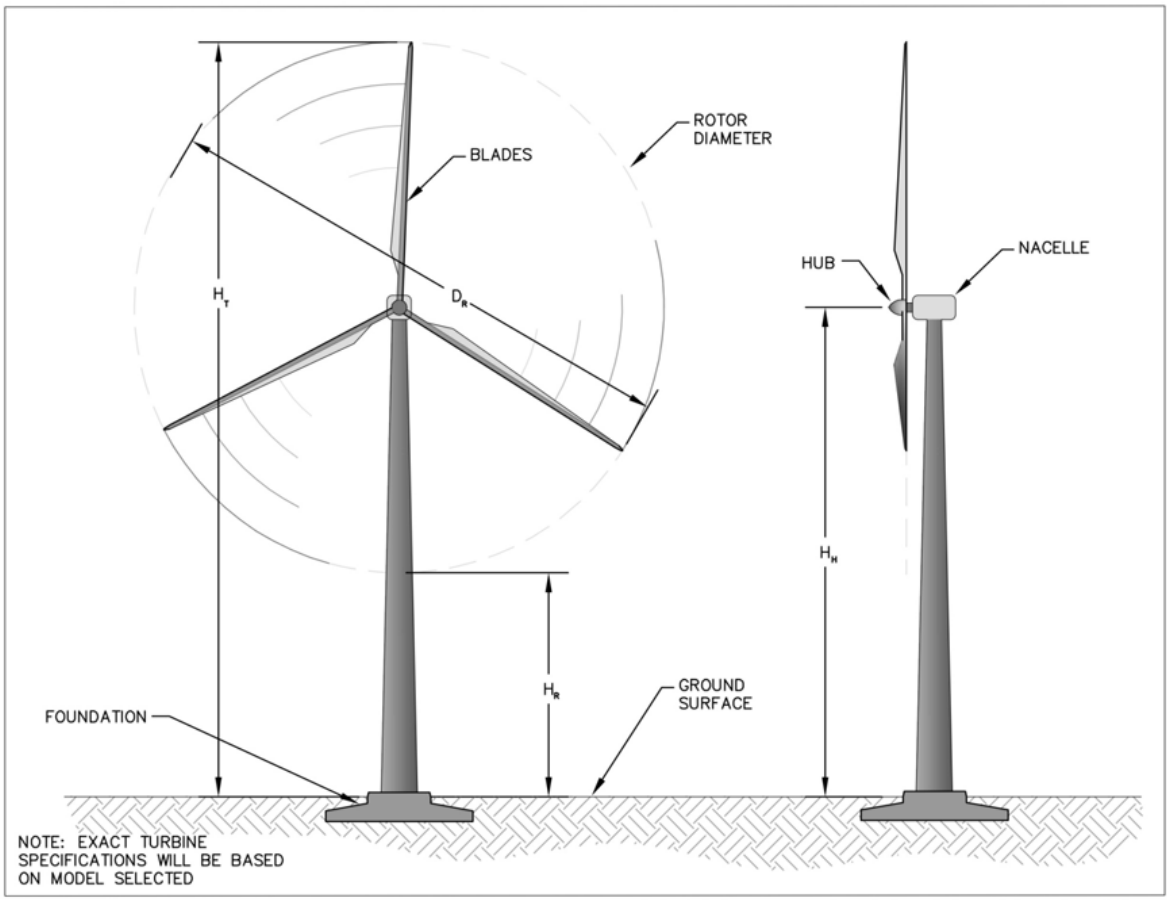

Figure 2-6. Typical Wind Turbine Diagram (PCW 2014a)

Wind Turbine Site Activities

Each wind turbine site includes three overlapping areas, as discussed in Section 2.2.1.2.1: initial clearing and grading areas, long-term modification areas, and activity areas. The initial clearing and grading area is the area around the wind turbine where vegetation would be removed and the ground surface would be leveled to install the turbine, including the turbine's foundation and electrical connections. Following installation of the wind turbine, portions of the initial clearing and grading area would be reclaimed so that a much smaller graveled area would remain at each site. This would be the long-term modification area, which would be a gravel-filled area that provides access to the turbine during operation and maintenance. Activity areas are areas at a wind turbine site that would not be cleared or graded, but where workforce and vehicles may need access to support wind turbine erection. In these areas, vehicles (for example, pickup trucks, all-terrain vehicles, and rough-terrain cranes) and crews on foot would use designated routes to support turbine erection. In activity areas, thick vegetation higher than 1 foot may be cut or partially cut to allow for safe vehicle access and to minimize fire hazard.

The initial clearing and grading area at each wind turbine site would be used for the following:

- Foundation construction, including component staging and concrete placement
- Separated stockpiles of topsoil and subsoil from site grading and foundation excavation
- Soil preparation for backfill, if needed
- Electrical line trenching and pad mount component placement
- Turbine component storage prior to erection
- Turn-around area for delivery vehicles (if needed)
- Pads for main erection crane, and routes in and out for cranes
- Operation areas for rough-terrain and other smaller support cranes used in component offloading, rotor assembly, and turbine erection
- Hub location for turbine rotor assembly

The initial clearing and grading area at wind turbine sites would not have a grade greater than 5 percent and would have sufficient soil depth to support the turbine assembly activities. Where grading is necessary, the site would be graded to tie the access road into the native terrain at a maximum slope of 4:1 unless otherwise specified in site plans. For purposes of planning and permitting, it is assumed that each wind turbine site would be cleared and graded.

The foundations for wind turbines are designed to securely hold the wind turbine in place, account for the local soil and weather conditions, meet applicable codes, be cost effective, and meet load and design requirements based on manufacturer specifications. Loads include extreme loads due to wind or operation, normal operating loads, and fatigue loads. Design requirements include items like required minimum foundation stiffness, maximum allowable differential settlement, and tower connection details.

The primary wind turbine foundation design selected for the CCSM Phase I Project is the mat foundation, also referred to as spread-footing, gravity, or inverted-T. Mat foundations are the most widely used design for wind turbine foundations due to their versatility. Mat foundations were chosen for the CCSM Phase I Project because they allow for a wide range of soil conditions and they are simple to construct, requiring only shallow excavations. Due to their versatility, mat foundations are anticipated to be suitable for most wind turbine sites in the CCSM Phase I Project. On average, each wind turbine foundation is anticipated to require less than 600 CY of concrete.

Wind Turbine Operation

Wind turbines would operate autonomously based on sensors that detect the conditions of the wind, the power grid, and the turbine itself. When the power grid is available to accept power and there is sufficient wind, the wind turbines would operate and generate power in an automatic mode. CCSM Phase I Project operators would monitor turbine conditions from the operations center.

The CCSM Phase I Project is designed to extract the maximum potential wind energy from the Chokecherry and Sierra Madre WDAs while minimizing the potential for eagle take (PCW 2014a, 2015). Based on wind resource mapping provided by the U.S. Department of Energy's National Renewable Energy Laboratory (NREL), only about 2 percent of the continental United States land area has an annual average wind resource above 20 miles per hour (mph), which is considered ideal for wind turbine operation (NREL 2009, as cited in BLM 2012b). Much of the total ideal wind resource exists in mountainous areas that are impractical for wind energy development. However, about 5 percent of the total ideal wind resource is concentrated within the boundaries of the Chokecherry and Sierra Madre WDAs (BLM 2012b). The wind power potential of the Chokecherry and Sierra Madre WDAs was modeled by AWS Truewind Solutions and validated by NREL as Class 5 (excellent; 16.8 to 17.9 mph at 50 meters); Class 6 (outstanding; 17.9 to 19.7 mph at 50 meters); or Class 7 (superb; >19.7 mph at 50 meters). Wind speeds within the Chokecherry and Sierra Madre WDAs are greater than those generally recorded for nearby Rawlins. Average wind speeds in the Chokecherry WDA are approximately 21 mph (9.5 meters per second), and winds are predominantly from the southwest. Average wind speeds in the Sierra Madre WDA are approximately 22 mph (9.9 meters per second) and also are predominantly from the southwest (PCW 2014a).

The majority of the maintenance activities associated with the CCSM Phase I Project would occur during daylight hours. Nighttime activities outside of buildings and substations would be rare. Temporary lighting would be used during instances where nighttime activities are required away from substations and buildings. When safety considerations allow, these lights would be equipped with downward shields to illuminate light in a target area and reduce stray ambient lighting. For nighttime turbine operation and maintenance activities in close proximity to buildings and substations, a combined switch and motion-detection system for exterior lights would be used.

Maintenance activities for wind turbines fall into two categories: scheduled and unscheduled. Scheduled maintenance would be planned by CCSM Phase I Project management and performed by the maintenance teams. If a turbine's sensors detect a problem with the turbine or grid, the turbine would shut down and send a notification to the operations center through the Project's Supervisory Control and Data Acquisition (SCADA) system. Operators would then inform the maintenance teams that an unscheduled maintenance check on the turbine is required.

Following cessation of operation at the end of the lifetime of the CCSM Phase I Project, the site would be decommissioned. Decommissioning activities are not covered under the scope of the ETPs currently being applied for and are therefore not evaluated further in this EIS. If decommissioning would require a standard ETP, we would evaluate decommissioning activities at that time.

2.2.1.2.3 Additional Phase I Wind Turbine Development Features

As described in the ECP, the Phase I wind turbine development would include roads, electrical systems (including electrical lines and substations), operation and maintenance buildings, meteorological towers, utilities, and temporary features associated with the

turbines, in addition to the turbines themselves. These features are discussed below, and many of these features are shown in Figures 2-4 and 2-5.

Roads

The roads constructed for the CCSM Phase I Project would provide access between the Phase I Haul Road and the wind turbines, overhead collection and transmission line structures, meteorological towers, and other elements. The CCSM Phase I Project would have five road classes to accommodate different levels and types of traffic. Design specifications and requirements for the proposed roads have been identified in the CCSM Project Road Design Manual (PCW 2014a).

The proposed road alignments were chosen to minimize the number of drainage crossings to the extent practicable. Where crossings would be necessary, crossing locations were chosen to minimize the impacts required and to reduce drainage crossings at locations near turbine sites. Drainage crossings for turbine and facility roads would allow for use of at-grade low water crossings where appropriate.

During site operation and maintenance activities, dust from the roads would be controlled to the maximum extent practicable. Periodic maintenance of the roads would include blading the roads to allow for safe access and to minimize long-term dust generation. Weather and traffic may cause long-term road base degradation. If the road base becomes degraded to the point where the function of the road is reduced, road repairs, such as recompaction or the addition of aggregate, would be undertaken as needed.

Electrical Systems

Several electrical systems would be needed to transfer the electrical energy generated by the Phase I wind turbines to the power grid:

- A collection system from the individual wind turbines to collection substations
- Collection substations
- An internal transmission system connecting the collection substations to the interconnection substation
- An interconnection substation that would transmit electricity generated by the CCSM Phase I Project to the power grid

Each wind turbine would be connected to a central SCADA system, which would allow the turbines to be controlled and monitored remotely. The turbines would be connected with fiber optics that would be co-located with the collection system, which is discussed in the following paragraph. Monitoring and controlling the wind turbines would occur at the operations center located in the northern infrastructure area.

The wind turbines would be connected electrically using a 34.5-kilovolt (kV) collection system to transmit electricity to the power grid. In the collection system, multiple turbines would be grouped together onto a single collection circuit routed to nearby collection substations. The collection circuits would use a combination of underground cables and

overhead lines to connect the wind turbines to the collection substation. The design of the collection system, including where underground and overhead lines are used, would be based on the wind turbine and substation locations and a wide range of technical, environmental, and economic factors. Underground electric lines are typically used for connection between adjacent wind turbines.

The underground portions of the collection system would consist of the power cables (three single-conductor cables), trench ground conductor, and fiber optic cable buried together in a trench. The power cable would be a 35-kV-class cable suitable for direct burial. Underground collection circuits would connect to an overhead line via a riser pole. A given circuit could have multiple riser poles to allow multiple segments to feed into the overhead line.

The overhead collection system lines would primarily use steel poles. Using steel poles would minimize clearing and grading by allowing for fewer poles spread further apart and would eliminate unnecessary parallel lines by allowing the use of double-circuit structures, which carry two sets of overhead lines instead of one. Wood poles would still be used for single-circuit segments of the overhead collection system where feasible. To the extent practical, the overhead collection system would follow terrain features, such as valleys or the base of ridgelines, to reduce the visual effect of the overhead lines.

Overhead collection system lines between the turbines in Upper Miller Hill and the substations in Lower Miller Hill would be used to eliminate the need to trench down steep slopes and to avoid the need for additional substations in Upper Miller Hill. Overhead lines would also be used in Lower Miller Hill and Nevins Ridge to collect and transmit power from groups of turbines distant from the substations to minimize the necessary site preparation and electrical losses.

The Avian Power Line Interaction Committee (APLIC) has developed recommended practices designed to reduce operational and avian risks that result from avian interactions with electric facilities (APLIC 2006, 2012). The CCSM Phase I Project collection system would be designed to APLIC recommendations by ensuring that vertical and horizontal separation distances between energized components and between energized components and grounded elements meet or exceed APLIC recommendations of the “wrist-to-wrist” measurements of the largest bird that may occur in the vicinity of the CCSM Phase I Project (that is, bald and golden eagles).

The CCSM Phase I Project collection substations would be used to collect electrical generation from groups of wind turbines. This would be accomplished by connecting all of the collection circuits from a turbine region to a collection substation. At the collection substation, the power would be increased in voltage and placed on the internal transmission system.

Four collection substations would be included in the CCSM Phase I Project. Two substations (Nevins Valley and Smith Draw) would be located in Nevins Ridge in the Chokecherry WDA, and two substations (McCarthy and Pine Grove) would be located in Lower Miller Hill in the Sierra Madre WDA. Battery backup systems would be used at the substations to operate the protection and relaying systems, station lighting, and equipment heating systems.

Portable generators could also be used in the event of a long-term outage, but no bulk fuel would be permanently stored at the substations. Each substation would be designed to meet or exceed APLIC recommendations of the "wrist-to-wrist" measurements of bald and golden eagles and fenced to keep out livestock, wildlife, and unauthorized personnel.

The internal transmission lines would be 230-kV lines designed to transfer the electrical generation from the collection substations to the Overland interconnection substation. The transmission line corridors would follow the proposed roads as closely as practicable, reducing the need for parallel transmission structure access roads. The internal transmission lines would be constructed using steel monopole structures to reduce impacts on wildlife in accordance with the BLM ROD. Minimum horizontal and vertical clearances would be calculated using National Electric Safety Code or similar requirements.

The CCSM Phase I Project's internal transmission system would include two primary transmission lines: Line A would connect the McCarthy and Pine Grove collection substations to the Overland Substation, and Line B would connect the Nevins Valley and Smith Draw collection substations to the Overland Substation. The areas that would be required for construction of each transmission structure, including those areas where cable reel trucks and tensioning equipment would need to be staged, have been identified and included in overall site preparation calculations.

Similar to the overhead collection system, the internal transmission system would adhere to APLIC recommendations by ensuring that vertical and horizontal separation distances between energized components and between energized components and grounded elements meet or exceed APLIC recommendations of the "wrist-to-wrist" measurements of bald and golden eagles (APLIC 2006, 2012).

The Overland Substation would be the CCSM Phase I Project's connection point to the power grid. This substation would operate entirely at 230 kV and would collect the generation from the internal transmission system onto two main buses. From there, the system would be connected to external transmission lines. The protection and relaying systems, station lighting, and equipment heating systems at the Overland Substation would use battery backup systems. Portable generators may be used in the event of a long-term outage; however, no bulk fuel would be permanently stored at the Overland Substation. A fence would surround the perimeter of the Overland Substation to keep out livestock, wildlife, and unauthorized personnel.

During operation of the electrical system, regular inspections would occur. Maintenance activities would primarily consist of managing vegetation by removing tree branches within about 50 feet of the overhead electrical system structures and conductors.

Operation and Maintenance Buildings

The CCSM Phase I Project includes construction and operation of an operations center and two maintenance buildings. Design and construction of these buildings would conform to the International Building Code along with applicable local code requirements. The buildings would be prefabricated and designed for the area's climate conditions.

The CCSM Phase I Project operations center would be located north of the Chokecherry WDA as shown in Figure 2-4. The operations center would consist of approximately 5,000 square feet of office space and a 2,500-square-foot high-bay warehouse, as well as associated parking.

Two maintenance buildings and associated parking would be constructed for the CCSM Phase I Project. These buildings would provide spare parts storage and maintenance workspace. The Chokecherry maintenance building, to be constructed in the Nevins Valley area near the Chokecherry Knob feature, would support the wind turbines in the Chokecherry WDA. The Sierra Madre maintenance building would be constructed in the Lower Miller Hill area along CR 401 (Sage Creek Road). This maintenance building would support the wind turbines in the Sierra Madre WDA. The maintenance buildings would each consist of a 2,500-square-foot office area and a 5,000-square-foot high-bay warehouse.

Meteorological Towers

The Phase I development area would include 10 meteorological towers to gather wind data for the area: four in Upper Miller Hill, three in Lower Miller Hill, and three in Nevins Ridge. Self-supporting (free standing and non-guyed) lattice meteorological towers would be used based on design requirements and to minimize impacts on wildlife based on the proposed mitigation measures from the BLM ROD. The average height of meteorological towers is approximately 200 feet, but towers can extend up to a height of 330 feet. Because of the height of the meteorological towers, it is anticipated that each would be equipped with an aviation warning light.

Utilities

Utilities, including water, sewer, and electrical power, would be required for construction of the Phase I wind turbine development and infrastructure components and operation of the CCSM Phase I Project. Water would be used for dust control and human use. Water consumption would be highest during construction activities (reaching a peak of 105 acre-feet per year), and lower during operations (less than 50 acre-feet per year) and decommissioning (less than 100 acre-feet per year).

The primary components of the CCSM Phase I Project water system would include three groundwater wells, water pipelines, water filling stations, and a potential municipal water connection. Wastewater would be treated by septic systems and potentially by the City of Rawlins through wastewater connections.

Temporary Features

As described in the ECP (see Attachment A), some additional temporary features would be necessary during construction, including 10 laydown yards, crane assembly areas, and temporary crane paths. The footprints of these temporary features are included in the overall surface modification areas provided in Tables 2-1 and 2-2.

For construction of the Phase I wind turbine development and infrastructure components for the CCSM Phase I Project, up to 6 double-wide and 10 single-wide temporary construction

trailers would be required at the North laydown yard, with no more than 3 additional single-wide trailers at any other laydown yard on a temporary basis. All temporary on-site accommodations for construction workers would be located in the North laydown yard.

2.2.1.2.4 Infrastructure Components

If granted, the standard ETP would cover activities that would result in disturbance of eagles during construction of the infrastructure components. These infrastructure components would be required for construction of the Phase I wind development and are described below.

Phase I Haul Road and Facilities

The Phase I Haul Road and Facilities would include the Haul Road, arterial and facility access roads, three water stations, one water extraction facility, and five laydown yards (see Figures 2-4 and 2-5). The Haul Road would include the North Entrance, South Entrance, and roads designed to meet both the haul road and arterial road classifications (including North Road, Chokecherry Road, Miller Hill Road, and Lower Miller Hill Road); however, the combined road network is referred to as the Phase I Haul Road.

The Phase I Haul Road would provide access to I-80, the West Sinclair Rail Facility, the Road Rock Quarry, and the Chokecherry and Sierra Madre WDAs. The Phase I Haul Road and Facilities would consist of approximately 59.5 miles of road (2.6 miles of existing roads and 56.9 miles of new or improved roads) and 225 acres of long-term modification. Construction of the Phase I Haul Road and Facilities is anticipated to begin in 2016 and would be completed in 2017 to support construction, operation, maintenance, and decommissioning of the CCSM Phase I Project. Any portions constructed prior to securing an ETP for construction activities are still subject to compliance with BGEPA.

The Phase I Haul Road would have a design speed of 40 mph. Secondary roads would have a slower design speed of 20 mph. The width of the Haul Road would be suitable for two-way traffic. Culverts are anticipated to be used for all crossings by the main Haul Road, as well as all large and moderate drainage crossings (that is, watersheds greater than 10 square miles). For smaller crossings along lower traffic roads, at-grade low water crossings would be used. Ongoing use of the Haul Road would be covered under the programmatic ETP for the CCSM Phase I Project once construction of the road system is complete.

The three water stations and one water extraction facility proposed as part of the Phase I Haul Road and Facilities would provide the infrastructure necessary to obtain and distribute water for both construction and operation of the CCSM Phase I Project. The water stations would include Smith Draw Water Station, McCarthy Water Station, and Pine Grove Water Station, and the water extraction facility would be the North Platte River Water Extraction Facility.

The water stations would be designed to connect a water supply to a water filling station, where water would be loaded onto trucks for use throughout the Phase I development and infrastructure areas. Each water station would consist of a water filling station, a water supply well or connection to surface or municipal supplies, an underground pipeline between the water supply and the water filling station, and associated roads. The Smith Draw Water Station would connect the Tuttle No. 2 well and the North Platte River Water Extraction

Facility to the Smith Draw Filling Station; the McCarthy Water Station would connect the McCarthy No. 1 well to the McCarthy Filling Station; and the Pine Grove Water Station would connect the Tuttle No. 1 well to the Pine Grove Filling Station.

The North Platte River Water Extraction Facility would extract surface water from the North Platte River and transmit it to the Smith Draw Water Station. The North Platte River Water Extraction Facility would include the North Platte Pump Station, buried water pipeline, and two booster pump stations. The North Platte Pump Station would consist of a submersible pump (approximately 50 horsepower) mounted in a 72-inch precast concrete wet well adjacent to the North Platte River. The wet well would be connected to the river by a 24-inch intake pipe. A check valve would be placed between the wet well and the river.

The five laydown yards associated with the Phase I Haul Road and Facilities would be the North, Chokecherry, Basin, West Deadman, and Miller Hill laydown areas. Each laydown area would have locations for vehicle and equipment parking, material storage, portable sanitation facilities, and waste storage. An area for vehicle refueling and fuel storage would also be established in each laydown yard. The North laydown yard would be used as the primary location for temporary construction trailers for the CCSM Phase I Project.

West Sinclair Rail Facility

The West Sinclair Rail Facility would be located southwest of Sinclair, along the northern boundary of the Chokecherry WDA (see Figure 2-4). The Rail Facility would consist of approximately 14 miles of new track, up to 181 acres of laydown area needed for material and component storage, and an access road. Construction of the Rail Facility is anticipated to begin in 2017 and is scheduled to be completed in 2018 to support construction of the Phase I wind turbine development and infrastructure components for the CCSM Phase I Project.

The Rail Facility would be a multi-modal facility, meaning it would be able to receive and store components and material delivered by both rail and truck. The facility would consist of three unloading tracks and four staging tracks configured in a hybrid loop/multi-siding arrangement. The facility would be able to accommodate up to three trains, each up to 6,500 feet in length, onsite at one time, and would process and unload up to four trains per week. Other materials and components may arrive via individual railcars or groups of railcars that are dropped off at an interchange siding.

Trains would enter and leave the Rail Facility using two connection points to the UPRR main line, one east of the Rail Facility near mile marker 678 and one west near mile marker 680. The Rail Facility running track (Track A) would be built parallel to and south of the UPRR main line between the two connection points. The Rail Facility would include a wye junction and a lead track that connects to the running track; this would allow the unloading and laydown areas of the Rail Facility to be located farther from the UPRR main line.

The laydown yards for the Rail Facility would store wind turbine components and stockpiles of aggregate and other construction material. The North laydown yard is designed to store up to 150 complete wind turbines (or about 1,500 large turbine components). An administrative office trailer for the Rail Facility would be located within the laydown yards. The office

trailer would include office and meeting spaces as well as a break room. Adjacent to the trailer would be employee parking, portable toilets, and equipment storage containers.

The Rail Facility would also include a 0.9-mile-long access road connecting the Rail Facility to the CCSM Phase I Project's internal road network. The access road would be routed from the southeast corner of the laydown yards to the Phase I Haul Road. The Rail Facility's access road would be designed to meet the haul road classification with a 40-foot-wide driving surface, a design speed of up to 40 mph, and accommodations for two-way traffic.

Road Rock Quarry

The Road Rock Quarry would provide a local source of aggregate for the CCSM Phase I Project. The Quarry would be located approximately 2 miles south of Rawlins (see Figure 2-4). The Quarry is an existing quarry that has been operated intermittently over the last 100 years. Commercial quarrying last occurred at the Road Rock Quarry in the 1960s.

Quarry operations for the CCSM Phase I Project would consist of surface rock (open-cut) mining and processing of sandstones and shales of the Mesaverde Group. Material mined from the Quarry would be used for road construction, construction fill, site grading, and other similar uses.

The Quarry would include an access road (Quarry Road), a material extraction area, stockpiles, and northern and southern operations areas. Quarry Road would run approximately 5 miles from the eastern portion of the Quarry to Chokecherry Road and would be designed with a 40-foot-wide driving surface, a design speed of up to 40 mph, and accommodations for two-way traffic. Quarry Road would also include a one-way arterial loop to facilitate truck loading and turnaround.

In the Northern Operations Area of the Quarry, excavated rock material would be processed into aggregate and loaded onto trucks for delivery to the CCSM Phase I Project. The Northern Operations Area would consist of the crusher area, finished product stockpile, and truck loading area. The Southern Operations Area would be designed to accommodate the office trailers, parking, and any necessary non-material storage for the Quarry.

Mobilization and demobilization of the Quarry would occur each year of construction coincident with each construction season of the CCSM Phase I Project. No permanent structures would be constructed at the Quarry. Portable office trailers would be used for Quarry construction and operations, and portable crushers would be used to process the material. Material load-out at the Quarry would be accomplished using wheel loaders or portable conveyor belts to load the aggregate and fill into trucks.

2.2.1.2.5 Project Schedule

The infrastructure components for the CCSM Phase I Project (that is, the Phase I Haul Road and Facilities, West Sinclair Rail Facility, and Road Rock Quarry) would be constructed prior to the Phase I wind turbine development in order to open the Chokecherry and Sierra Madre WDAs to road and rail access. Construction of the Phase I Haul Road and Facilities and the West Sinclair Rail Facility are anticipated to begin in 2016. Construction of the

infrastructure components is expected to continue through 2019. Some construction activities would not disturb eagles and their nests to the degree defined as "disturbance take" (see Section 1.7.2) and therefore would not require that a standard ETP be issued.

Following construction of the infrastructure components, the highest wind energy potential areas would be developed first; in other words, Phase I of the Sierra Madre WDA would be constructed first, followed by Phase I of the Chokecherry WDA. Within the Sierra Madre WDA, wind turbine construction would begin in Upper Miller Hill, then would move to Pine Grove, and would finish in McCarthy (see detailed figures in Attachment A). In the Chokecherry WDA, wind turbine construction would begin in Smith Draw and would finish in Nevins Valley. PCW proposes to install 229 turbines in 2019 and another 271 turbines in 2020.

The Phase I construction schedule would comply with the requirements of the BLM ROD, and would also meet the following objectives:

- Comply with applicable wildlife timing stipulations defined in the ECP and Phase I BBCS (see Attachments A and B, respectively)
- Comply with mitigation measure GEN-1 from the BLM ROD; that is, "limit surface disturbance to areas where turbines would be constructed within 12 months with a goal to mitigate impacts from surface disturbances to wildlife, soils, water, and vegetation (e.g., weeds)" (BLM 2012b)
- Construct the Phase I wind turbine development efficiently and cost-effectively by performing similar activities at the same time within a sub-region
- Develop the highest wind energy potential areas first by prioritizing construction in the Sierra Madre WDA

Based on the typical weather at the Phase I development and infrastructure areas, the practical construction season has been determined to be between June and October of each year. Construction crews would be mobilized in May for work to begin in June, and work would be concluded in October with demobilization in November. In addition to weather restrictions, the schedule reflects wildlife timing restrictions defined in the ECP and Phase I BBCS (see Attachments A and B, respectively). The most restrictive wildlife stipulations prohibit new clearing, grading, or mowing in some areas until as late as July 15 of each year.

Vehicle access for construction of the Phase I wind turbine development and infrastructure components for the CCSM Phase I Project would be through two entrances, the North Entrance and the South Entrance. The North Entrance is off of I-80 at Exit 221 and then south along CR 407/CIG Road. The South Entrance is off of WYO 71/CR 401 (Sage Creek Road) approximately 17 miles south of Rawlins. The peak workforce for the construction of the CCSM Phase I Project is anticipated to be 761 workers in July and August 2017.

2.2.1.3 Eagle Fatality Prediction

2.2.1.3.1 Overview

As described in the ECP guidance (USFWS 2013b), we developed a Bayesian model to predict the annual fatality rate for bald and golden eagles at a given wind energy facility. Bayesian modeling is a statistical procedure that estimates an unknown distribution based on an observed distribution (also known as prior data). The eagle fatality prediction model defines the relationship between eagle exposure, collision probability, and fatalities, while accounting for uncertainties (USFWS 2013b). It uses pre-construction observation data at a proposed wind facility to predict post-construction collision probability (USFWS 2013b). The general logic behind the model is that the more time an eagle is present in a defined 200-meter cylindrical area around a turbine, the more likely a collision will occur. The model was peer-reviewed in "Summary Report: Peer Review of the Scientific Findings in the U.S. Fish and Wildlife Service Eagle Fatality Model and its Application to Wind Energy Development Projects," prepared by AMEC Environment & Infrastructure, Inc. for USFWS Region 6, Division of Migratory Birds (USFWS 2013c).

The Bayesian model incorporates site-specific values and general information. Site-specific values include eagle observation data collected during pre-construction monitoring efforts, turbine rotor radius, and daylight hours (the number of hours in a year that turbines could be spinning when eagles may be active). Eagle observation data include a compilation of observation effort (amount of time conducting observations for eagles and the total area observed) and the total time eagles (by species) were observed in the proximity of the proposed layout of wind turbines (defined as eagle minutes and used to calculate the exposure rate). General information includes exposure rates and collision probability for eagles based on data collected at existing wind energy facilities in North America (this information is referred to as prior data) (USFWS 2013b).

The model equation reads as follows:

Collision Fatalities = Exposure Rate * Collision Probability * Expansion Term

- Exposure Rate is measured in eagle minutes per hour per square kilometer, which is calculated as the total number of minutes eagles are recorded flying up to 200 meters above ground level within the project footprint during pre-construction surveys.
- Collision Probability is the probability of an eagle colliding with a turbine given exposure and is based on prior data.
- Expansion Term is the product of daylight hours and turbine hazardous area.
    - Daylight hours represent the potential number of hours that eagles may be exposed to collision with wind turbines and can be adjusted to account for non-operational periods if known. Because eagles are rarely active at night, the model uses daylight hours.
    - Turbine hazardous area is calculated as a three-dimensional cylindrical volume around a turbine from ground level to a height of 200 meters (650 feet). An increase in turbine blade diameter results in a greater value for the turbine hazardous area.

We used data collected by PCW, the proposed Phase I wind turbine layout, and our USFWS-published modeling methods (USFWS 2013b; New et al. 2015) to predict eagle fatality for the CCSM Phase I Project. The eagle fatality prediction was used to help evaluate the risk category for the CCSM Phase I Project and to develop compensatory mitigation requirements.

The number of estimated eagle fatalities was calculated by using long-watch data collected at the Phase I development and infrastructure areas from April 2011 to July 2012, and 0.5 mile fixed-point count data collected from August 2012 to August 2013 (see Attachment C, the USFWS eagle fatality prediction analysis executive summary, for additional detail).

2.2.1.3.2 Avoidance and Minimization Measures Incorporated into the Proposed Project to Minimize Eagle Take

The final eagle fatality prediction included in Attachment C and the final Phase I turbine layout incorporate avoidance and minimization measures that were developed over a 7-year period (2007 to 2014) of wind and site evaluation, permitting with the BLM, and cooperation between PCW and us. During this period, PCW removed several high wind potential areas as wind turbine sites, and reconfigured the layout of turbines in the CCSM Phase I Project through six major revision stages to avoid and minimize potential impacts on eagles and other wildlife species (PCW 2014a).

The combination of the Phase I turbine layout, the proposed conservation measures, best management practices (BMPs), EACPs, and monitoring and adaptive management measures have been developed and proposed with the intent that they would avoid and minimize impacts on bald and golden eagles such that remaining take is unavoidable.

The major avoidance and minimization measures that PCW has incorporated into project design of the CCSM Phase I Project are summarized below:

- Eliminated wind turbine locations in the southernmost area of the Sierra Madre WDA and the western area of Upper Miller Hill based on raptor nest locations, greater sage-grouse lek and habitat locations, habitat for other avian and wildlife species, and other environmental constraints.
- Established 328-foot (100-meter) wind turbine setbacks from the Miller Hill Rim to reduce impacts on raptors.
- Removed all wind energy development from the greater sage-grouse core areas that were designated in 2010 and are still protected by Wyoming State Executive Order 2015-4 (State of Wyoming 2015).
- Removed wind turbines from north of the hogback and south of Rasmussen Reservoir to reduce potential risks to eagles based on observed eagle use.
- Established turbine no-build areas where PCW documented high eagle and other raptor use, movement corridors, and nesting and foraging habitats. Eagle use within the designated turbine no-build areas represents approximately 80 percent of all eagle use reported by PCW as observed during the 2011 and 2012 long-watch raptor surveys. The no-build areas are shown in Figure 2-3.

- Removed turbines from the Red Rim-Grizzly Wildlife Habitat Management Area (WHMA), located west and south of the Miller Hill portion of the Sierra Madre WDA. The Red Rim-Grizzly WHMA is managed to benefit big game and other wildlife species that serve as important forage for eagles. Survey data demonstrated that survey points adjacent to and within the Red Rim-Grizzly WHMA had relatively high eagle and other raptor use compared to other areas that are currently proposed for the CCSM Phase I Project.
- Established timing windows for clearing and grading and disruptive activities, as well as exclusion areas for greater sage-grouse and Columbian sharp-tailed grouse leks, nesting areas, early brood-rearing areas, and delineated winter concentration areas.
- Established timing windows for clearing and grading and disruptive activities for raptor nests, yellow-billed cuckoo nests, mountain plover habitat, big game crucial winter range, and big game parturition, or birthing, areas.
- Agreed to implement employee, contractor, and site visitor requirements to avoid harassment and disruption of wildlife, especially during reproductive seasons; to prohibit or control pets onsite to avoid harassment and disruption of wildlife; and to enforce speed limits to reduce wildlife collisions, disruption, and airborne dust.
- Moved well locations, roads, ancillary facilities, and other surface structures requiring repeated human presence away from most raptor nests (an 825-foot buffer for most species, and a 1,200-foot buffer for ferruginous hawks).
- Agreed to implement procedures for using explosives and conducting blasting activities within specified times and at specified distances from sensitive wildlife, streams, and lakes.
- Adopted our avoidance and minimization recommendations for the Phase I Haul Road, Road Rock Quarry, North Platte River Water Extraction Facility, and wind turbine locations, and operation curtailments relative to eagle nests, areas of concentrated prey resources, and other project-specific eagle activity areas.
- Agreed to curtail operation of any turbines that are located within 1 mile (1,600 meters) of unoccupied golden eagle nests during daylight hours between February 1 and April 30 or until nest activity is determined. If a nest were to become active during this period, turbines within 2.2 miles (3,500 meters) would be curtailed during the breeding season until the young fledge and are no longer dependent on the nest or until the nest becomes unoccupied. The 2.2-mile distance is used because it is half of the mean inter-nest distance (MIND), which for the CCSM Phase I Project is 4.4 miles (7,000 meters), as described in Section 2.2.1.4.3. To minimize the amount of curtailment, PCW moved most turbines more than 1 mile from all eagle nests and up to 2.2 miles away from recently active nests.

2.2.1.3.3 Predicted Annual Eagle Take and Disturbance (Incorporating Avoidance and Minimization Measures)

The annual eagle fatalities estimated by the Bayesian eagle fatality model were extrapolated to the length of the 5-year permit. We used our eagle fatality model to estimate eagle take for bald and golden eagles separately. Because the wind turbine blade diameter has not been finalized, the fatality modeling for the CCSM Phase I Project used two potential rotor diameters—338 feet (103 meters) and 394 feet (120 meters)—to calculate the cylindrical

area, or turbine hazardous area, which is part of the expansion factor. If the programmatic ETP is granted, PCW would provide us with the exact turbine blade diameter, and the predicted annual eagle take would be recalculated at that time.

We used the risk-averse 80 percent upper credible limit (80th quantile) of the model output to calculate potential annual take (USFWS 2013b). This can be interpreted as an 80 percent chance, assuming our model is accurate, that the true number of fatalities will be less than or equal to our prediction. Conversely, there is a 20 percent chance that the CCSM Phase I Project would cause more eagle fatalities than are allowed by the permit (see the ECP guidance, Figure D-4 [USFWS 2013b] for an example of the 80th quantile). The eagle fatality estimate for the CCSM Phase I Project was calculated after applying all of the proposed avoidance and minimization measures. The estimated annual take by eagle species and wind turbine blade diameter is presented in Table 2-5.

Table 2-5. Alternative 1 Estimated Annual Programmatic Eagle Take for the CCSM Phase I Project

Species	394-foot-diameter (120-meter-diameter) Wind Turbine Blade	338-foot-diameter (103-meter-diameter) Wind Turbine Blade
Bald eagle	2	1
Golden eagle	14	10

We make a number of assumptions to account for uncertainty and to incorporate natural variability into the model. A complete description of our model, the assumptions we made, and the data we used in the model are provided in Attachment C.

In addition to the programmatic take predicted for the CCSM Phase I Project, we have determined that disturbance take from construction activities for the Phase I wind turbine development and infrastructure components for the CCSM Phase I Project is likely to occur during construction. As described in Chapter 1.0, BGEPA defines “disturb” as “to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior” (50 CFR 22.3). Disturbance take is a consideration relative to eagle nests, roosts, and concentration areas, such as areas of concentrated prey resources. For the CCSM Phase I Project, the anticipated disturbance would be to eagle nests. Sources of potential disturbance take from construction activities associated with the Phase I wind turbine development and infrastructure components for the CCSM Phase I Project include noise and traffic impacts.

As a result of avoidance and minimization measures discussed in Section 2.2.1.3.2, no eagle nests currently occur within 0.5 mile (800 meters) of a proposed wind turbine. However, five eagle nests lie within 0.5 mile (800 meters) of proposed Phase I infrastructure components. Of the five nests within 0.5 mile (800 meters) of proposed infrastructure components, one golden eagle nest is located approximately 0.1 mile (160 meters) from the access road

leading to the Road Rock Quarry, one bald eagle nest is located approximately 0.1 mile (160 meters) from the North Platte River Water Extraction Facility access road, and three golden eagle nests are located along the Phase I Haul Road, approximately 0.06 mile (100 meters), 0.1 mile (160 meters), and 0.4 mile (650 meters) away. Some activities required for construction of the infrastructure components of the CCSM Phase I Project would potentially disturb the five eagle nests (four golden eagle nests and one bald eagle nest) described above from noise, traffic, and human presence.

For purposes of estimating disturbance take, we assume two adult eagles are present in each nest. As shown in Table 2-6, the standard permit would thus cover disturbance take at four golden eagle nests and one bald eagle nest on an annual basis until project construction is completed. Disturbance take would include injury to eagles at these nests, any reduction of productivity at these nests, or abandonment of these nests. The term of the standard ETP would be 4 years (2016 through 2019, or until the first turbine is operating).

Table 2-6. Alternative 1 Estimated Annual Eagle Disturbance from the CCSM Phase I Project

Species	Number of Nests	Number of Eagles
Bald eagle	1	2
Golden eagle	4	8

2.2.1.3.4 Conservation Measures and Best Management Practices from PCW's ECP

Before applying for an ETP, applicants must first incorporate measures to avoid and minimize the take of eagles into their project planning. As part of the CCSM Phase I Project, PCW would employ conservation measures and BMPs, as included in the ECP (see Attachment A) and described below, to reduce risk to eagles and decrease eagle fatalities.

Conservation Measures from PCW's ECP

As described in the ECP (see Attachment A), conservation measures to avoid and minimize impacts on eagles and other avian species from construction and operation activities associated with the Phase I wind turbine development and infrastructure components for the CCSM Phase I Project would include land management commitments, conservation easements, greater sage-grouse conservation, mesic habitat improvement, relic agricultural field enhancements, wildfire emergency stabilization and burned area rehabilitation, suspension of hunting activities, and incorporation of an environmental training program.

Land Management

The Overland Trail Cattle Company LLC (TOTCO) owns the ranch that encompasses the CCSM Phase I Project and has executed cooperative agreements and grazing leases for use of the federal and state lands contained therein. TOTCO currently manages a cow-calf and yearling livestock grazing operation in much of the Phase I development and infrastructure areas and in portions of property adjacent to the Phase I development and infrastructure

areas. As part of the CCSM Phase I Project, PCW and TOTCO would commit to continuing with the cow-calf and yearling grazing operation, and would not revert back to sheep, which might be more likely to attract eagles and place them at risk. PCW and TOTCO would also commit to continuing the use of active management to minimize impacts of livestock grazing activities on wildlife and habitat. This would include carcass removal and active herd management. As stated in the ECP (see Attachment A), PCW would coordinate with TOTCO, other committed private landowners, the Wyoming Game and Fish Department (WGFD), and the BLM to conserve or enhance terrestrial and aquatic habitat, as well as to protect important eagle foraging, breeding, and nesting habitat for the life of the CCSM Phase I Project.

Conservation Easements

PCW would coordinate with TOTCO to place approximately 27,500 acres of private land owned by TOTCO east of the WDAs and along either side of the North Platte River into a conservation easement. As described in the ECP, the conservation easement would include important eagle use areas and high-quality eagle foraging habitats adjacent to key nesting locations along the North Platte River and in other areas with documented eagle use. The conservation easement would prohibit wind development activities on the lands subject to the easement in perpetuity.

Greater Sage-Grouse Conservation

PCW would improve habitat and minimize potential threats to greater sage-grouse and other wildlife species as part of its sage-grouse conservation plan (located in the BLM ROD, Attachment B). The measures included in the sage-grouse conservation plan are designed to conserve greater sage-grouse populations and habitat; however, these measures also would have direct benefits to eagles and other raptors by maintaining contiguous habitat patches, conserving and promoting prey base populations, and improving habitat quality throughout the Phase I development and infrastructure areas and the adjacent TOTCO ranch.

As PCW states in its ECP (see Attachment A), bald and golden eagles are known to prey on greater sage-grouse in the vicinity of the CCSM Phase I Project. Greater sage-grouse tags have been recovered from bald and golden eagle nests, and recovered greater sage-grouse carcasses often have evidence of fatality caused by eagles. The conservation measures that would be implemented for the CCSM Phase I Project include the minimization or removal of some existing threats to greater sage-grouse survival and productivity (for example, fence removal and marking, water development projects, and riparian/wetland habitat enhancement).

Mesic Habitat Improvements

As described in the ECP (see Attachment A), the primary objective of mesic (moderately moist) habitat improvement projects is to modify water sources to create and enhance natural free-flowing water and wet meadow habitats that are used by greater sage-grouse and other avian species, including eagles. Habitat improvement projects undertaken by PCW could include installation of upland “bubblers” and water diversions to create and enhance natural

free-flowing water, to enhance wet meadow habitat, and to flood bottomland draws. "Bubblers" would be supplied with water from both artesian wells and actively pumped wells. Other water sources to be developed would be supplied through water diversion pipelines from existing reservoirs and stock tank pipeline networks. Water improvement projects would be completed in a manner to minimize standing water and discourage use by mosquitoes, which might carry West Nile virus.

Relic Agricultural Field Enhancements

Approximately 2,023 acres of relic agricultural fields are located in the eastern portion of the TOTCO-owned ranch outside of the CCSM Phase I Project that are currently dominated by monocultures of cheatgrass (*Bromus tectorum*), crested wheatgrass (*Agropyron cristatum* sp.), or other introduced plant species. These relic fields currently provide little value to any avian species. The primary objectives of the relic agricultural field enhancements would be to establish conditions suitable for year-round use by wildlife species including eagle prey species. This would include, as appropriate, planting additional sagebrush/shrub cover, establishing high-value forage and cover sources, or both in the relic agricultural fields. Relic agricultural field enhancements, if successful, would improve prey base availability in areas outside of the CCSM Phase I Project, providing new foraging locations for eagles.

Wildfire Emergency Stabilization and Burned Area Rehabilitation

Wildfire, particularly in low-elevation Wyoming big sagebrush systems, has resulted in substantial habitat loss primarily because of subsequent invasion by cheatgrass and other noxious weeds and invasive plant species (Miller et al. 2011, as cited in BLM 2011). For example, in 2010, a 170-acre wildfire occurred within the Chokecherry WDA. Following the fire, PCW seeded portions of the burned area to stabilize soils, reduce the risk of noxious weeds and invasive plant species invasion, and encourage use by greater sage-grouse and other wildlife species.

PCW would work with the BLM to prioritize wildfire emergency stabilization and burned area revegetation projects to (1) maintain unburned intact sagebrush habitat when at risk from adjacent threats, (2) stabilize soils, (3) reestablish hydrologic function, (4) promote biological integrity, (5) promote plant resiliency, (6) limit expansion or dominance of invasive species, and (7) reestablish native species.

Suspension of Hunting

PCW states in the ECP (see Attachment A) that TOTCO has indefinitely suspended access for hunting of greater sage-grouse on all of its private lands and other areas under its control, thereby reducing direct mortality of greater sage-grouse, a prey species for eagles. Suspension of greater sage-grouse hunting access would continue throughout the life of the CCSM Phase I Project or as otherwise agreed to among PCW, TOTCO, and WGFD. Elimination of hunting would eliminate potential carcasses of injured or unrecovered birds shot by hunters. This would remove a potential source of carrion (or dead and decaying flesh of an animal) in the Phase I development and infrastructure areas that might otherwise attract eagles, and could reduce ingestion of lead shot by eagles.

Environmental Training Program

As part of its environmental compliance and monitoring plan for the CCSM Phase I Project, PCW would implement an environmental training program for compliance with environmental permits, including permit requirements and conservation measures associated with the ETPs. The training program would be designed to consistently communicate requirements for the CCSM Phase I Project to every individual working on the project so that both managers and workers understand PCW's expectations, the permit requirements, and how to incorporate the permit requirements into their daily work activities. The program would incorporate site-specific training modules to minimize risks to avian species. All personnel working on the CCSM Phase I Project would be required to attend environmental training prior to working onsite. PCW would maintain environmental training attendance records through the end of construction.

Best Management Practices from PCW's ECP

As PCW describes in its ECP (see Attachment A), PCW would implement the following BMPs to reduce potential impacts on species of concern, including eagles and other avian species, during construction and operation of the Phase I wind turbine development and infrastructure components for the CCSM Phase I Project:

- Land and habitat impacts during all site development and construction activities would be minimized.
- Native species would be used when seeding or planting during reclamation activities.
- Site infrastructure, including roads, power lines, and fences, would be designed to avoid sensitive natural resources and would be minimized to the maximum extent practicable. Where appropriate, wildlife-compatible design standards for fencing would be used.
- Power lines associated with the collection system for the CCSM Phase I Project would be located underground to the extent practical. All overhead power lines would be designed to meet or exceed APLIC recommendations, as outlined in the *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006* (2006 Suggested Practices) and *Reducing Avian Collisions with Power Lines: The State of the Art in 2012* (2012 Collision Manual) (APLIC 2006, 2012).
- All permanent meteorological and communication towers for the CCSM Phase I Project would be self-supporting and would not be supported by guy wires, which could present a collision risk for eagles and other birds.
- A portion of the Phase I turbines would be lighted; all lights on turbines would meet Federal Aviation Administration requirements and would likely consist of medium intensity synchronized red LED lights.
- Exterior lighting at operation and maintenance facilities and substations for the CCSM Phase I Project would be shielded downward and would be designed to use a combined switch and motion-detection system for exterior lights to minimize the time the lights are on while providing adequate safety for personnel. All internal turbine nacelle and tower lighting would be extinguished when the nacelle and tower are unoccupied.

- Tubular wind turbine towers would be used to reduce the ability of birds to perch and to reduce risk of collision.
- Appropriate speed limits would be enforced for all roads in the Phase I development and infrastructure areas.
- All employees, contractors, and site visitors would participate in a site orientation during which they would be instructed to avoid harassment of and interference with wildlife.
- Site plans, including an erosion control plan, stormwater pollution prevention plan, fire safety plan, health and safety plan, hazardous material management plan, weed management plan, and waste management plan, would be developed and adhered to in accordance with applicable regulations and agency recommendations.

2.2.1.4 Permit Stipulations

We would attach stipulations to the standard and programmatic ETPs issued for construction and operation activities, respectively, associated with the Phase I wind turbine development and infrastructure components for the CCSM Phase I Project. These stipulations would include the permit duration; EACPs as well as additional BMPs; monitoring; adaptive management; and compensatory mitigation requirements, as discussed in the following sections.

2.2.1.4.1 Duration

The standard ETP issued for disturbance take during construction of the Phase I wind turbine development and infrastructure components for the CCSM Phase I Project would take effect immediately upon permit issuance and would cover all construction and site development activities until the CCSM Phase I Project is operational. Construction is anticipated to begin in 2016 and be complete by 2020. Any construction occurring prior to securing a standard ETP for disturbance take associated with construction activities is still subject to compliance with BGEPA.

The duration of the programmatic ETP for operation of the CCSM Phase I Project would be 5 years. The permit would take effect once the first turbine is put into operation, which is anticipated to be in 2019, and would cover the operation of all 500 turbines and ongoing operation of site infrastructure. The 5-year permit duration is a requirement of the ETP regulations as defined in 50 CFR Parts 13 and 22.

Going forward, we assume that PCW would reapply for a programmatic ETP at 5-year intervals. We would review any reapplications we receive and make a decision about whether or not to issue successive programmatic ETPs. During the review process, we would reassess fatality rates, effectiveness of measures implemented to reduce take, eagle population status, and the amount of additional compensatory mitigation that would be required for continued operation. The compensatory mitigation required for each 5-year permit must fully mitigate for the predicted loss of eagles for the permit duration. The compensatory mitigation must persist in the environment for a minimum of 10 years.

2.2.1.4.2 Advanced Conservation Practices and Best Management Practices

ACPs are defined as "scientifically supportable measures that are approved by the [USFWS] and represent the best available techniques to reduce eagle disturbance and ongoing mortalities to a level where remaining take is unavoidable" (50 CFR 22.3). We have not currently approved any ACPs for wind energy projects; therefore, ACPs are implemented at wind energy facilities on an experimental basis and are referred to as EACPs.

To further our goals to develop and evaluate EACPs for wind energy projects, we would work with PCW to cooperatively review and apply EACPs to the operation of the CCSM Phase I Project as part of the adaptive management process. PCW has agreed to some seasonal curtailment for specific turbines as part of avoidance and minimization measures, discussed in Section 2.2.1.3.2. However, additional seasonal and daily turbine shut-downs (curtailment) would be an example of an EACP that may be considered as part of the permit stipulations. Additional BMPs may also be incorporated as part of the permit, following our review of the permit application and evaluation of feedback from the public, agencies, and tribes during the Draft EIS review process.

2.2.1.4.3 Monitoring

We would require monitoring of eagle fatalities and eagle nests as part of the stipulations of any ETPs we may issue for the CCSM Phase I Project and as described in the ECP (see Attachment A). Post-construction monitoring for the CCSM Phase I Project would be required in order for us to estimate the mean annual fatality rate associated with project operations and to ensure that the permitted level of eagle take is not exceeded. Monitoring of eagle nests would be required both during construction of the Phase I wind turbine development and infrastructure components for the CCSM Phase I Project and after the CCSM Phase I Project is operational in order for us to assess the possible disturbance effects of construction activities and project operations on eagles.

Post-Construction Eagle Fatality Monitoring

Post-construction eagle fatality monitoring for the CCSM Phase I Project would involve searching for eagle remains beneath turbines and other facilities to estimate the number of fatalities that occur during operation of the CCSM Phase I Project. The monitoring data would also be used to determine whether any patterns of fatalities are present within the Phase I development and infrastructure areas so that factors associated with those fatalities can be identified and addressed, if possible, through adaptive management and application of additional conservation measures and EACPs.

Post-construction eagle fatality monitoring would be completed for the CCSM Phase I Project using current, scale-modified protocols to document take. Site-specific characteristics of the Phase I development and infrastructure areas would be accounted for in the design of the monitoring protocols to account for differences in vegetation cover and height, snow cover, season, and carcass persistence. The Phase I post-construction eagle fatality monitoring program would be required to achieve a 95 percent level of certainty that permitted take is not exceeded.

The programmatic ETP for the CCSM Phase I Project would require post-construction eagle fatality monitoring during the first 5 years of turbine operation. We would use the monitoring data compiled during the first 2 years to determine the protocol for years 3 through 5. The monitoring data from the first 5 years would then help inform the protocol for subsequent years as part of an adaptive management approach should a permit be reissued after the first 5 years. During the first 2 years of operation, each of the 500 turbines would be searched once per month with a 33-foot (10-meter) transect spacing. The transect width could be adjusted later to 66 feet (20 meter) if the data indicate that the adjustment is valid.

The once-per-month frequency was determined in a non-project-specific study to be appropriate to account for carcass scavenging rates based in northeastern Utah and northwestern Colorado (Lehman et al. 2010). However, the frequency of searches could need to be adjusted based on actual scavenger removal rates for the CCSM Phase I Project. Searches would be conducted within 240- by 240-meter (approximately 787- by 787-foot) square plots oriented such that the largest distance searched (that is, the diagonal of the square) would be aligned in the direction of prevailing winds. Using results of site-specific carcass persistence and searcher efficiency trials during the first 2 years, the number of turbines searched, the interval between searches, transect spacing, and search plot size could be adjusted through the adaptive management process to optimize the sampling design while achieving the goal of 95 percent level of certainty that permitted take is not exceeded.

When an eagle fatality is discovered, the searcher would mark the remains with a flag(s). After completing the search of that turbine, the searcher would immediately return to the flagged remains to collect data in accordance with the recommendations set forth in the ECP guidance (USFWS 2013b) and Wind Energy Guidelines (USFWS 2012a). All remains, parts, or feathers would be photo-documented, and all potential injuries or lack thereof, signs of scavenging, and identifying characteristics would be documented. Any additional conditions regarding specific project requirements would be included as permit conditions in the ETP.

PCW would notify our Office of Law Enforcement within 24 hours of the discovery of any dead or injured eagle in the Phase I development and infrastructure areas. Eagle remains would not be moved until notification occurs. The handling and removal of eagle remains would occur in accordance with ETP conditions. All remains, parts, and feathers of any bald and golden eagles found onsite would ultimately be sent to the National Eagle Repository. The National Eagle Repository is operated by our Office of Law Enforcement and is located at the Rocky Mountain Arsenal National Wildlife Refuge northeast of Denver, Colorado. The Repository receives, evaluates, stores, and distributes bald and golden eagles, parts, and feathers to Native Americans who are enrolled members of federally recognized tribes throughout the United States.

If an injured eagle is encountered either during a survey or incidentally, the location and time of the observation, as well as the observed behavior and injury, would be recorded and the information given to our Office of Law Enforcement when they are contacted. If we so direct, a qualified biologist, such as a state game biologist, or other certified wildlife handler would be contacted to handle the eagle. The biologist or handler would attempt to capture the injured eagle unless such capture would cause additional injury or harm. Once the injured eagle has been captured, it would be transferred to a federally and state-permitted wildlife

rehabilitation center with available capacity. Permitted eagle rehabilitation facilities near the CCSM Phase I Project include the North Park Wildlife Rehabilitation in Waldon, Colorado; the Born Free Wildlife Rehabilitation in Steamboat Springs, Colorado; and the Rocky Mountain Raptor Program in Fort Collins, Colorado. The nearest rehabilitation facility in Wyoming is the Teton Raptor Center near Jackson Hole.

During periods of post-construction eagle fatality monitoring, both searcher efficiency trials and carcass persistence trials would be conducted and the results used to adjust final fatality estimates. Searcher efficiency would be calculated as the proportion of trial carcasses found by a searcher relative to the total number of carcasses placed for that searcher's trial. Searcher efficiency trials would be conducted blindly, without the knowledge of the searcher involved, and simultaneously with formal carcass searches at a subset of the searched turbines. Carcasses used for eagle surrogates could include dark colored geese, turkeys, or non-eagle raptors.

Separate searcher efficiency rates would be calculated for each season, for each searcher, and for each variable used in fatality model estimates. These categories would be coded in the observed fatality and carcass persistence data for the adjusted fatality estimate analyses. The appropriate number of carcasses used for searcher efficiency trials would take into account site-specific carcass persistence rates in the Phase I development and infrastructure areas.

Carcass persistence trials would involve revisiting the carcasses used for eagle surrogates in the searcher efficiency trials on days 1 through 7, 14, 21, and 28 in each season. Following the day 28 visit, carcasses would continue to be visited weekly until they are scavenged or 90 days, whichever is sooner. Seasonal carcass persistence trials would account for the effects of weather, differential carcass decay rates, scavenger densities, and scavenger behavior across seasons.

We would work with PCW to determine the adjusted fatality estimate for eagles during operation of the CCSM Phase I Project. Fatality estimates would be based on observed eagle remains found during formal fatality searches, the probability that a searcher could miss a non-eagle carcass (searcher efficiency correction factor), the probability that a carcass could be removed before a searcher can locate it (carcass persistence correction factor), the date of the last search at a particular search plot prior to finding a carcass (search interval), the proportion of turbines searched to the total number of turbines at the facility, and the proportion of non-eagle carcasses found within searchable areas beneath each turbine (or similar search area correction). Adjusted fatality estimates would be compared to permitted take levels to ensure that the goal of 95 percent certainty that the permit limit has not been exceeded is achieved.

All operations and maintenance personnel working on the CCSM Phase I Project would be trained on how to identify eagle fatalities. Educational information concerning protection of eagles and identification of injured or dead eagles would be posted in the operations center. Instructions and procedures that personnel must follow in the event that an injured or dead eagle is discovered onsite would be included with the educational information, including whom to notify and what actions must be taken. As described above, PCW would notify our Office of Law Enforcement within 24 hours of the discovery of any dead or injured eagle in

the Phase I development and infrastructure areas. Eagle remains would not be moved until notification occurs. If necessary permits have been obtained, then following the collection of remains-specific data, the permit holder would remove the remains from the field to a secure location. Any fatality discovered during times other than the formal fatality surveys would be considered an incidental record. Incidental records would be provided to us along with other post-construction monitoring results.

Annual reports detailing the eagle fatality monitoring results and adjusted fatality estimates would be submitted to us. The annual reports would discuss fatalities in the context of spatial and seasonal distribution and, as warranted, would present recommendations for future monitoring, conservation measures, and adaptive management.

Eagle Nest Monitoring

As a requirement of the ETPs, PCW would conduct eagle nest surveys throughout the nesting season (January 1 to August 31) to determine if disturbance of eagle nests is occurring from activities associated with the construction or operation of the Phase I wind turbine development and infrastructure components for the CCSM Phase I Project. The eagle nest surveys would be consistent with the ECP guidance (USFWS 2013b) and with recommendations we provided to PCW in 2015 regarding post-construction monitoring for the CCSM Phase I Project. All eagle nests within the mean inter-nest distance (MIND) of eagle nests within the Phase I development and infrastructure areas would be surveyed throughout the terms of the ETPs. The MIND for the CCSM Phase I Project is 4.4 miles (7,000 meters). The purpose of eagle nest monitoring is to determine whether eagles nests are occupied or unoccupied; when occupied, to determine the productivity and nest success (USFWS 2013b, Appendix H); and to assess whether disturbance take could occur during construction or operation activities. The data collected on eagle nests within the MIND would help inform the operation of certain turbines sited within the MIND.

There are no communal roosts within the MIND based on pre-construction survey data and BLM historical records. Therefore, monitoring of communal eagle roosts would not be required.

We would determine if any disturbance or other take of eagle nests has occurred through interpretation of the occupancy, productivity, and nest success data collected from the eagle nests within the MIND. If we determine that nest disturbance from construction or operation activities has occurred, we would consider additional conservation measures and EACPs that might be effective in reducing the effect under the adaptive management plan. Alternatively, we could require additional compensatory mitigation to offset the estimated decreases in productivity to the extent necessary to meet the statutory requirement to preserve eagles.

Additionally, if eagle behaviors indicative of disturbance are detected within feeding and sheltering areas elsewhere in the Phase I development and infrastructure areas during construction, additional conservation measures and EACPs may be implemented through the adaptive management process.

2.2.1.4.4 Adaptive Management

To provide a feedback mechanism that allows for follow-up on the implementation of various EACPs, BMPs, and other risk reduction measures, an adaptive management process would be employed as part of the programmatic ETP. The intent of the adaptive management process is to provide a framework in which the uncertainty related to factors that influence collision risk can be monitored, evaluated, and avoided and minimized to the extent practicable. For an adaptive management process to be successful, the monitoring of eagle populations and the conservation strategies and practices outlined in Section 2.2.1.4.2 should be integrated so that monitoring efforts could be clearly tied back to the goals and objectives of the ETP. Although the goal of the avoidance and minimization measures is to prevent eagle fatalities, it is anticipated that some level of eagle take would occur from the CCSM Phase I Project. As a result, an adaptive management process is necessary to adjust EACPs, BMPs, additional avoidance and minimization measures, and conservation efforts to reduce risk to eagles and other species to the extent practicable. It is also expected that over the life of the CCSM Phase I Project, additional BMPs and EACPs would become available. As such, adaptive management would be an essential component of the permit stipulations and would be employed to ensure that risk is minimized to the extent practicable.

2.2.1.4.5 Compensatory Mitigation

Compensatory mitigation is required when the avoidance and minimization measures do not remove the potential for take and the projected take exceeds calculated thresholds for the species-specific EMU in which the project is located. EMUs are described in Section 2.1.2.2. Compensatory mitigation can address pre-existing causes of eagle mortality, such as eagle electrocutions from power poles, or it can address increasing the carrying capacity of the eagle population in the affected EMU.

For bald eagles, we have determined that predicted recurring take during the CCSM Phase I Project would not exceed calculated EMU take thresholds; therefore, no compensatory mitigation is required for bald eagles at this time. During the life of the CCSM Phase I Project, if the recurring take of bald eagles were to exceed the EMU take thresholds, PCW would be required to provide compensatory mitigation for the take of bald eagles. The compensatory mitigation costs and actions would be calibrated to offset the predicted unavoidable take so that the no-net-loss standard is achieved.

For golden eagles, we have determined that species populations throughout the United States might not be able to sustain any additional unmitigated fatalities, and the threshold for take of this species is set at zero for populations at the BCR level (USFWS 2009). This means that any new authorized take of golden eagles for the CCSM Phase I Project must be at least equally offset by compensatory mitigation (that is, specific conservation actions that replace or otherwise make up for the loss of each eagle associated with the CCSM Phase I Project). As part of the ETP conditions, PCW would be required to provide compensatory mitigation for the predicted take of golden eagles at the 80th quantile of the predicted number of eagle fatalities per year for a 5-year period starting with the date that the CCSM Phase I Project becomes operational (USFWS 2013b). The amount of compensatory mitigation required would be adjusted in consultation with us for future years based on the observed fatality rate

over the initial 5-year period of post-construction eagle fatality monitoring. Before we would issue the ETP, we would have to review and approve PCW's commitments and binding agreements to perform compensatory mitigation. Sufficient compensatory mitigation for golden eagles would have to be conducted before there is take of a golden eagle; that is, before a given number of eagles is taken, sufficient compensatory mitigation must have been completed to offset that number of take.

As proposed in its programmatic ETP application, PCW would retrofit high-risk power poles to compensate for predicted golden eagle fatalities from operation of the CCSM Phase I Project. A high-risk power pole is one that results in a relatively high probability of avian electrocution. Typically, the areas with higher probability of avian electrocution are located in high-quality habitat or are poles with high numbers of primary conductors or primary and equipment jumpers and presence of grounding wires (EDM 2014). Retrofitting power poles is the only USFWS-approved form of compensatory mitigation for eagle take that has been approved at this time, though other mitigation approaches are considered under Alternative 2.

APLIC has developed guidance documents identifying minimization methods for avian electrocutions and collisions, and has released national Avian Protection Plan Guidelines in conjunction with us in 2005 (APLIC and USFWS 2005). In addition, APLIC provides electric utilities, wildlife agencies, and other stakeholders with guidance for reducing bird electrocutions and collisions with power lines based on the most current information, including its 2006 Suggested Practices and 2012 Collision Manual (APLIC 2006, 2012). Due to the large size of eagles' wingspans, in dry feather conditions the safe distance between energized components on power poles, or the electrocution clearance, for eagles is 60 inches (EDM 2014).

Before we would issue a programmatic ETP, PCW would develop a compensatory mitigation plan that would identify high-risk power poles to be retrofitted and describe specific measures for retrofitting poles. The measures would change the arrangement of the power lines so that eagles' wingspans could not form an electrical connection between charged components, which results in eagle electrocution. We would review this plan before issuing a programmatic ETP to be sure that the proposed measures have been proven effective in reducing electrocutions. The power pole retrofit plan would also include provisions for monitoring and maintaining the proposed measures over the duration of the permit.

We have determined that PCW can work within the four BCRs contiguous with the CCSM Phase I Project to locate and retrofit high-risk power poles according to APLIC guidelines. Eagles in each of these BCRs may migrate to or from the Phase I development and infrastructure areas. That is, eagles potentially affected by the CCSM Phase I Project can be part of any of the four BCR eagle populations (see Figure 2-2). We note that comments received from the scoping process and coordination with the cooperating agencies have expressed a preference for retrofitting power poles near the CCSM Phase I Project area, in particular within Carbon County.

At this time, the only range-wide estimates available for golden eagles are BCR-scale population estimates (USFWS 2013b). The four BCRs within which PCW may retrofit power poles are Northern Rockies (BCR 10), Southern Rockies/Colorado Plateau (BCR 16),

Badlands and Prairies (BCR 17), and Shortgrass Prairie (BCR 18), as described in Section 2.1.2.1 and shown in Figure 2-2.

We used the Resource Equivalency Analysis (REA; USFWS 2012b) to quantify the number of power pole retrofits needed to offset the take of golden eagles from the CCSM Phase I Project. Within the context of the ECP guidance (USFWS 2013b), REA is a methodology used to compare the injury to or loss of eagles caused by wind facilities (debit) to the benefits from projects designed to improve eagle survival or increase productivity (credits). Compensation is evaluated in terms of eagles and their associated services instead of by monetary valuation methods. Compensation that would be required for the CCSM Phase I Project is shown in Table 2-7.

Table 2-7. Required Compensatory Mitigation for Golden Eagle Take Due to the CCSM Phase I Project

Wind Turbine Blade Diameter and Number of Turbines in Phase I WDA	Annual Permitted Take	Number of Poles to be Retrofitted to Achieve No-Net-Loss of Golden Eagles	
		Assuming 5 Years of Avoided Loss From Retrofitted Poles	Assuming 10 Years of Avoided Loss From Retrofitted Poles
394-foot-diameter (120-meter-diameter) Wind Turbine Blade			
500 turbines	14	3,778	2,029
338-foot-diameter (103-meter-diameter) Wind Turbine Blade			
500 turbines	10	2,778	1,492

Our ECP guidance states that an ETP holder may either contribute funds to an appropriate independent third-party that is formally obligated to perform approved mitigation work, or execute an approved compensatory mitigation proposal and contract directly with a utility or utilities to complete the required number of retrofits (USFWS 2013b). PCW has indicated that its preference is to contract with utilities directly to complete the retrofits. If the programmatic ETP is approved, PCW would work with electric utilities to identify and retrofit high-risk power poles. Such utilities may include investor-owned utilities, electric cooperatives and their members, and public power districts. The approach to retrofitting power poles would include identifying high-risk power poles, identifying areas and habitat of greater risk to eagles, retrofitting or reframing, and conducting retrofit inspection and maintenance, as well as the associated costs for these activities. PCW may also consider rebuilding electric lines that pose risks to eagles. PCW would be required to conduct sufficient compensatory mitigation before take of a golden eagle occurs.

We would work with PCW to identify landscape areas of greater risk to eagles (that is, electrocutions and collisions) where retrofit efforts should be prioritized, or we would provide criteria for determining such areas where PCW should focus its efforts. PCW would then develop a power pole retrofit plan for our approval as part of the ETP review process.

Finally, PCW would work with utilities to identify high-risk electric power poles that pose potential risks to eagles.

2.2.2 Alternative 2 – Proposed Action with Different Mitigation

2.2.2.1 Overview

Under Alternative 2, we would issue to PCW a standard ETP for disturbance during construction of the Phase I wind turbine development and infrastructure components for the CCSM Phase I Project, and a programmatic ETP for operation of the CCSM Phase I Project, as described under Alternative 1 (Proposed Action). However, under Alternative 2, we would require PCW to implement a different form of compensatory mitigation within the four BCRs contiguous with the CCSM Phase I Project than proposed in its ETP applications. Compensatory mitigation can address pre-existing causes of eagle mortality, such as eagle electrocutions from power poles, or it can address increasing the carrying capacity of the eagle population in the affected EMU. PCW has indicated in its ETP applications that it would perform power pole retrofits, which would reduce the risk of mortality from existing transmission lines. We are considering the following forms of different mitigation and evaluating their applicability and effectiveness in providing for compensatory mitigation for predicted golden eagle take:

- Mitigation of older wind facilities
- Lead abatement
- Carcass removal
- Carcass avoidance
- Wind conservation easement
- Habitat enhancement, with prey enhancement as an essential component
- Rehabilitation of injured eagles

One or more of the mitigation options could be selected. However, for us to accept a potential compensatory mitigation option when issuing an ETP, we would need scientifically supportable evidence as a foundation for the conclusion that implementing the alternative compensatory mitigation action would achieve the desired beneficial offset in mortality or carrying capacity. That means that even if a potential compensatory mitigation option has many qualitative beneficial impacts, we would have to quantify the actual number of eagles saved by each particular mitigation option in order to establish the validity of the particular mitigation.

2.2.2.2 Covered Activities

The covered activities for Alternative 2 would be the same as described for Alternative 1 (Proposed Action) in Section 2.2.1.2.

2.2.2.3 Eagle Fatality Prediction

The eagle fatality prediction for Alternative 2 would be the same as described for Alternative 1 (Proposed Action) in Section 2.2.1.3. Disturbance of eagle nests would be the same as described for Alternative 1.

2.2.2.4 Permit Stipulations

Permit stipulations for the standard ETP and the programmatic ETP described for Alternative 1 (Proposed Action) in Section 2.2.1.4 would be the same for Alternative 2 with the exception of the type of compensatory mitigation required to offset the predicted number of golden eagle fatalities under the programmatic ETP. Several assessments of the potential benefits of different compensatory mitigation measures for golden eagles are currently taking place. However, we have not quantified the benefits associated with these mitigation measures, nor have we yet endorsed any of these compensatory mitigation measures. The challenge for other wind projects for using these potential measures for compensatory mitigation in relation to a programmatic ETP is to provide a credible, quantifiable prediction of the benefits of these mitigation measures on eagle survival or productivity, especially when the empirical data needed for making these predictions are limited or not currently available. That said, Alternative 2 considers several different means to potentially achieve the required level of compensatory mitigation for the predicted take of golden eagles from operation of the CCSM Phase I Project.

The different mitigation options we are considering were developed from scoping comment input, cooperating agency discussion, and research into the leading anthropogenic causes (that is, causes resulting from human activity) of golden eagle mortality. When possible, both the benefits and potential measures of mitigation success for the different options are discussed in Chapter 3.0. Studies have found that accidental trauma (that is, collisions with wind turbines, vehicles, or other structures) and electrocution account for a combined 50 to 70 percent of all documented direct anthropogenic causes of golden eagle mortality in the United States. Gunshot and poisoning account for another approximately 20 percent of all documented direct anthropogenic causes of golden eagle mortality (Franson et al. 1995; Kochert et al. 2002; Wayland et al. 2003; Tetra Tech 2011, as cited in Allison 2012). An important cause of indirect mortality for eagles is habitat loss (Scott 1985; Kochert et al. 2002).

2.2.2.4.1 Mitigation of Existing Wind Facilities

Mitigation of existing wind facilities would involve funding the decommissioning of existing wind energy developments or turbines that risk take of eagles, curtailing daytime operations at existing wind facilities where take of eagles is likely to occur, or upgrading equipment at older wind facilities. Golden eagle mortality caused by wind facilities is well documented at projects in North America and Europe (Hunt 2002; Tetra Tech 2011, as cited in Allison 2012). Estimates of eagle fatalities at wind facilities vary depending on several environmental factors, including exposure estimates, avoidance behavior, foraging habitat, prey base, geographic conditions, and habitat availability. The most comprehensive and longest-running studies, such as those being conducted at Altamont Pass Wind Resource

Area, also indicate that the highest source of golden eagle fatalities at a facility are associated with a number of factors, most notably tower design, turbine size, and rotation speed (Hunt 2002).

2.2.2.4.2 Lead Abatement

Big game hunting and recreational shooting of prairie dogs, ground squirrels, and other small mammals can result in elevated levels of lead concentrating in these animals, which can then contaminate eagles when eagles ingest the affected carcasses. Studies estimate that between 7 and 15 percent of eagle fatalities are associated with the ingestion of lead from eating carrion with lead fragments present (Wayland et al. 2003; Miller et al. 2000). The American Wind Wildlife Institute (AWWI) is currently assessing golden eagle fatalities associated with large mammal hunting. The study is intended to quantify the number of fatalities and provide data that can be used by the wind industry to offset eagle take (AWWI 2014a).

Although lead shot was banned from waterfowl hunting in 1991, its use remains common in ammunition for upland hunting and shooting sports, and in fishing tackle. Lead poisoning is a concern for eagles in most parts of their western range. Elevated levels of lead were found in 58 percent of the golden eagles evaluated in west-central Montana (Langner et al. 2015). Similarly, 62 percent of golden eagles tested from 1991 to 2008 in the Raptor Rehabilitation Program in Washington had blood lead levels considered toxic (Stauber et al. 2010).

Voluntary lead bullet and lead shot abatement and hunter education programs could reduce eagle fatalities by decreasing the number of incidents of lead poisoning. This mitigation measure would involve implementing programs designed to reduce the use of lead bullets and shot by targeting some of the resistance to changing ammunition from lead shot to non-toxic shot, or to reduce gut piles left by hunters in areas accessible to eagles. These programs would rely on voluntary participation and would not entail changing existing regulations governing use of lead in ammunition.

2.2.2.4.3 Carcass Removal

Eagles can be struck by vehicles while scavenging on roadkill such as deer, coyotes, livestock, or other mammals. Scavenging increases during the winter months when other food sources are less available. One study noted that nearly 100 golden eagle fatalities occurred on highways near Rock Springs, Wyoming, during the winter of 1984–1985 (Phillips 1986). Other regions of the country report that up to 29 percent of all bald eagle fatalities are caused by vehicle collisions along major highways (Michigan Department of Natural Resources and Environment 2010; Wisconsin Department of Natural Resources 2012, 2013). Removing carcasses from roadsides could reduce vehicle-eagle interaction and the number of eagles put at risk by this food source. This could be accomplished by having dedicated road crews remove carcasses from areas with high carcass density and relocate them to areas away from highways where vehicle interactions are eliminated.

Data on big game carcasses found along roadways within a 140-mile radius of the Phase I development and infrastructure areas were collected from State Departments of Transportation to determine what high-density carcass areas could be identified and

potentially targeted as a part of this mitigation strategy. (As discussed in Section 2.1.2.3, we used a 140-mile buffer around the CCSM Phase I Project to evaluate effects on golden eagles at the LAP level). For purposes of analysis in this EIS, high-density carcass areas were identified as those stretches of highway where over 50 carcasses within a 2-square-mile area were found over the past 7 to 8 years, for Colorado and Wyoming, respectively (Colorado Department of Transportation 2015a; Wyoming Department of Transportation 2015). We acknowledge that the data is inherently biased by data collection frequency and methodology. Data for Utah were not available. The high-density carcass areas identified within a 140-mile radius of the Phase I development and infrastructure areas are shown in red in Figure 2-7.

According to our ECP guidance (USFWS 2013b), as a compensatory mitigation strategy, a project developer or operator may collect data (or use existing data if it is available) on the annual number of eagle fatalities that result from vehicle collisions in a specified geographic area or along a specific stretch of roadway. These data could then be used to generate an estimate of the number of eagle fatalities that could be prevented in the same area by removing carcasses from roadsides. If there were sufficient evidence that carcass removal would result in quantifiable and verifiable benefits to eagles, the project developer or operator could contract to have these roadsides “cleaned” of carcasses during the time of year that large mammals concentrate and eagles are known to be struck. The credible estimate of eagle fatalities that would be avoided through carcass removal would be the value of the compensatory mitigation achieved.

The AWWI is currently developing a model that seeks to establish quantifiable positive effects on golden eagles through carcass removal along sections of highway systems (AWWI 2014a). This compensatory mitigation measure is currently being evaluated in relation to the Mohave County Wind Farm in Arizona. If appropriate and approved for use for the CCSM Phase I Project, PCW would work with us and with state and local highway departments to identify appropriate carcass removal protocols, including the frequency of carcass removal. Removal of carcasses would be focused in areas of high carcass density, such as those shown in Figure 2-7. PCW could perform carcass removal anywhere in the four BCRs; however, we would encourage PCW to focus carcass removal efforts within a 140-mile radius of the Phase I development and infrastructure areas. The Carbon County Planning and Development Department, a cooperating agency, has expressed support for carcass removal from highways in Carbon County.

Removal of carcasses along railroads could also benefit eagles. Eagles can be struck by trains while scavenging on the carcasses of animals killed by trains. The Saratoga-Encampment-Rawlins Conservation District, a cooperating agency, recommended that we consider this mitigation option in addition to removal of carcasses from roadways. Less information on railway-wildlife collisions is available than for carcasses found along roads (Wells et al. 1999; Dorsey et al. 2015). Unlike highways, railroad rights-of-way are typically private, with restricted access to the public; therefore, fewer records are collected on train-wildlife collisions. Additional data collection and coordination with railway operators would be required before we could estimate the number of eagle fatalities that would be avoided through carcass removal on railways.

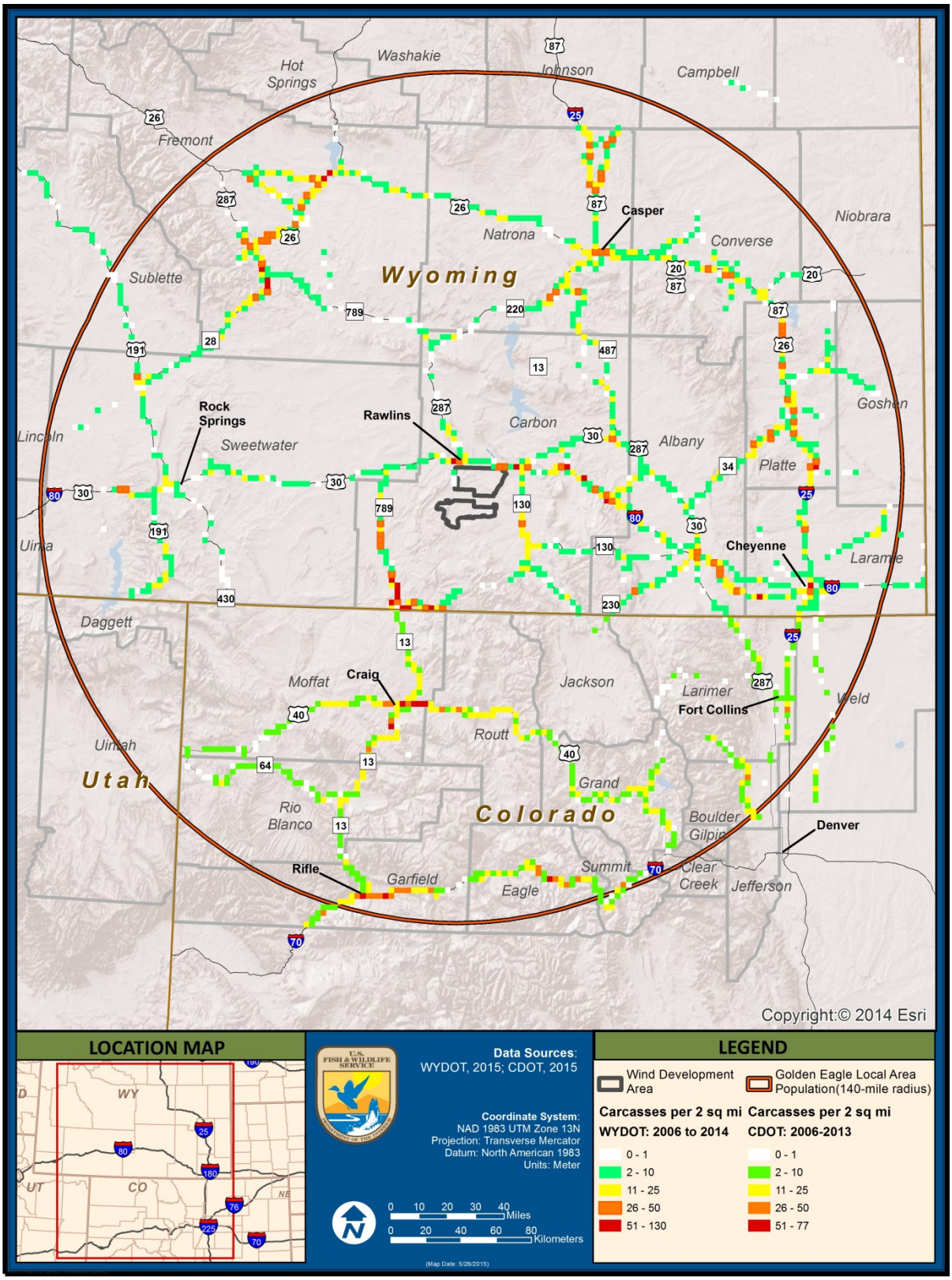

Figure 2-7. High-Density Carcass Areas Within 140 Miles of the CCSM Phase I Project in Wyoming

2.2.2.4.4 Carcass Avoidance

As discussed in Section 2.2.2.4.3 for the carcass removal mitigation option, eagles can be struck by vehicles while scavenging on roadkill such as deer, coyotes, livestock, or other mammals. Carcass avoidance refers to avoiding or decreasing the amount of carcasses that are generated on roads, which reduces vehicle-eagle interaction and the number of eagles put at risk by this potential food source. Carcass avoidance would be accomplished by constructing wildlife crossings across highway sections where vehicle-wildlife collisions are well documented. Generally, vehicle-wildlife collisions occur most frequently in areas where big game cross busy highways. Reducing the amount of big game crossing busy highways could be effective in reducing wildlife collisions with automobiles if the crossings are properly located on stretches of highways that have high densities of documented collisions.

Wildlife crossing structures are in use throughout the United States and are used by a variety of wildlife, including bears, mountain lions, elk, moose, deer, coyote, bobcat, ground squirrels, rabbits, and jackrabbits (Cramer 2012). Wildlife crossing structures have appeared to effectively reduce the number of wildlife on highways in Utah, Montana, and Colorado (Cramer 2012). Wildlife crossing types under consideration as part of Alternative 2 could include underpass tunnels and overpasses in areas where high densities of carcasses are recorded within 140 miles of the CCSM Phase I Project (see Figure 2-7).

As with any compensatory mitigation option, the mitigation would have to be completed before take of a golden eagle would occur under the terms of the ETPs. Under this option, that means that the wildlife crossing(s) would have to be built and operating before any golden eagle take would occur from the CCSM Phase I Project.

2.2.2.4.5 Wind Conservation Easement

A conservation easement is a tool used to conserve private land. A conservation easement (also known as a conservation restriction) is a legal agreement between a landowner and a land trust or government agency that permanently limits uses of the land to protect its conservation values. It allows landowners to continue to own and use their land, and they can also sell it or pass it on to heirs as long as they comply with any use restrictions.

As a compensatory mitigation option, a wind conservation easement would be an easement to protect land used by golden eagles from future wind energy development. Under this mitigation option, PCW would establish easements on undeveloped tracts of privately owned land that have high wind power potential (classified by NREL as Wind Power Class 5, 6, or 7). To calculate the benefits of this mitigation option, we would need to consider the likelihood of wind development occurring on the lands included in the easements and the likely potential number of turbines. We also would need to generate an estimate of the eagle fatalities that could result, but which would be avoided by establishing the easements.

We used datasets from NREL (2010, 2012) to identify lands within 140 miles of the CCSM Phase I Project that have high wind power potential (classified as Wind Power Class 5, 6, or 7). We then used data from BLM and the National Land Cover Database to identify undeveloped tracts of privately owned land within 140 miles of the CCSM Phase I Project.

The areas that are privately owned, currently undeveloped, and within Wind Power Classes 5, 6, and 7 were classified as areas with a high potential for wind power development that could be placed into wind conservation easements. These potential wind conservation areas are shown in Figure 2-8.

2.2.2.4.6 Habitat Enhancement

Golden eagles inhabit shrub-steppe and grasslands in a wide variety of landscapes. They tend to avoid areas with high human use. The loss of any portion of their breeding, foraging, roosting, or wintering habitats can have a detrimental effect on golden eagles (Kochert et al. 2002). Habitat loss that affects golden eagle populations can come in many forms. In the western United States, the most significant indirect threats to stable populations of golden eagles are the loss of breeding habitat; encroachment of residential, commercial, and industrial development; and other anthropogenic activities that fragment or destroy foraging and nesting areas (Phillips 1986; Kochert et al. 2002).

Encroachment through urbanization and agricultural conversion has altered areas historically used by eagles (Kochert et al. 1999). When rangelands are converted to agricultural land, habitats that eagle prey relies on for survival are lost. Consequently golden eagle populations are affected even if suitable nesting habitat is relatively abundant (Kochert et al. 1999, 2002). Extensive agricultural development reduces jackrabbit and snowshoe hare populations and makes areas less suitable for nesting and wintering eagles (Beecham and Kochert 1975; DOI 1979; Craig et al. 1986).

Fires have also caused large-scale losses of shrubs and prey habitat, which reduces golden eagle nest success (Kochert et al. 1999). Mining and various types of energy development can affect eagle breeding, foraging, and wintering habitat (Kochert et al. 1999). Recreation and other human activity near nests can also cause breeding failures (Steidl et al. 1993).

Destruction or adverse modification of eagle habitat or their prey base reduces eagle populations (Kochert et al. 2002); therefore, modification or improvement of eagle habitat or their prey base could be a potential compensatory mitigation option. For instance, if an artificial or natural habitat type is identified as attracting prey items for eagles or other large raptors, then recreating that habitat type could establish new or improved important eagle use areas. Artificial perch and nesting structures could also be constructed in areas with low levels of current or possible future development, creating “safe” zones for eagles. However, at this time, we lack good data on how useful such artificial structures are for eagles.

Habitat enhancement could occur within conservation banks that protect or enhance golden eagle nesting, foraging, or congregation sites. These land areas could be restored from a degraded condition and then conserved and permanently managed for eagles and other wildlife. Conservation banks could provide an opportunity to reverse declines in breeding, floating, or juvenile eagles and to improve conservation for these birds. Conservation banks could also be created to protect species and habitats that are at risk of becoming endangered or threatened. These protections could offset fatalities from a given project by ensuring continued use and protection of high-use golden eagle sites.

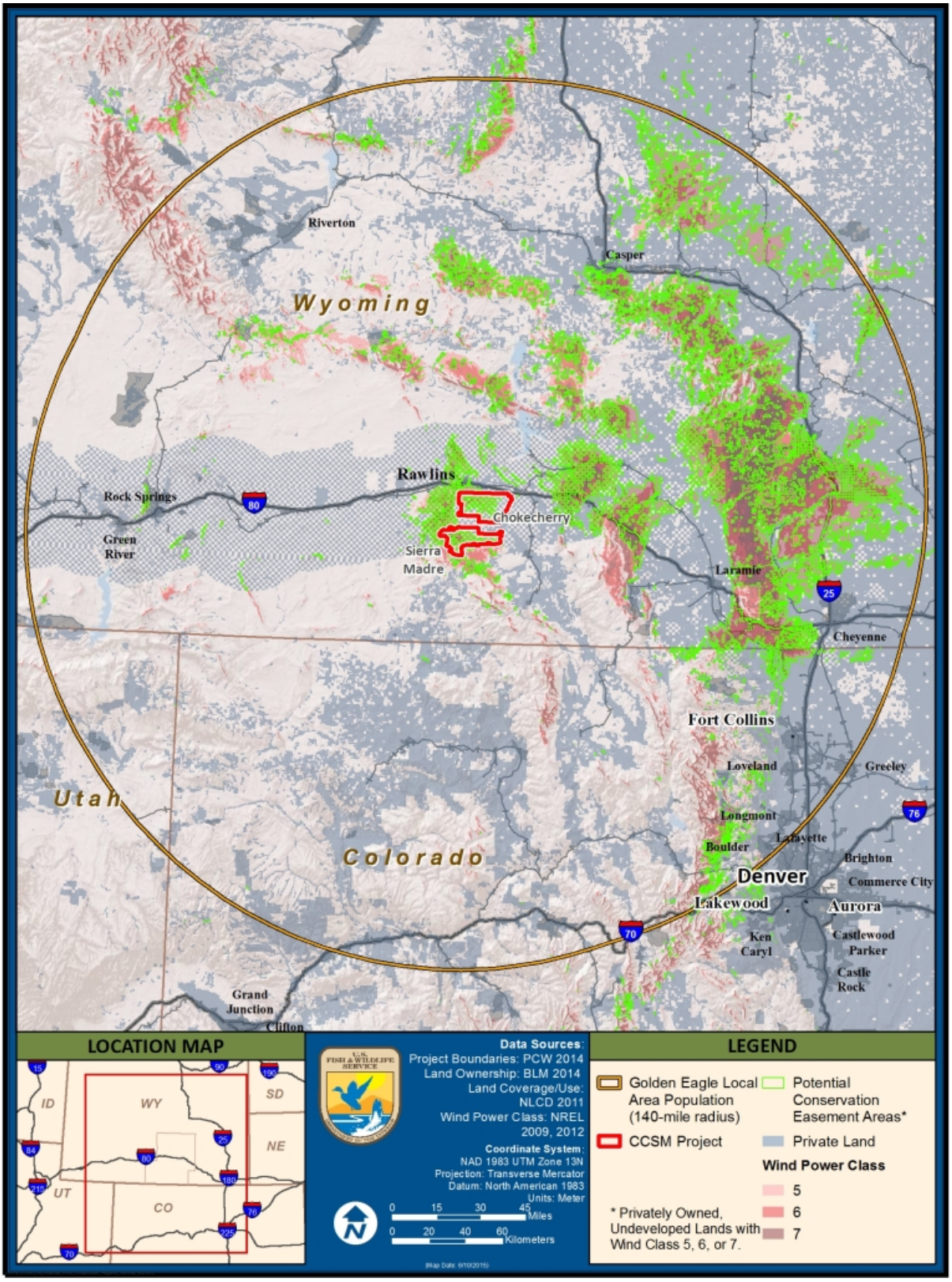

Figure 2-8. Potential Wind Conservation Areas Within 140 Miles of the Chokecherry and Sierra Madre Wind Development Areas for the CCSM Phase I Project in Wyoming

Increasing prey availability would be a component of habitat enhancement. Increasing prey availability is an indirect method of providing benefits to eagles. Because prey availability contributes to fledgling success and survivability (Kochert et al. 2002), it stands to reason that increasing the numbers of prey species would benefit eagle health and success in raising young. Protection of known foraging sites, such as prairie dog colonies, or habitats restored to provide prey habitat used by known prey species could benefit the survival of adult birds and enhance their ability to provide sustenance to young eagles. The benefits to golden eagles resulting from habitat enhancement could potentially be quantified through a resource equivalency analysis model.

2.2.2.4.7 Rehabilitation of Injured Eagles

Wildlife and raptor rehabilitation centers are intended to provide for the medical care of wildlife by licensed rehabilitators. These centers acquire sick, injured, debilitated, and orphaned wildlife to provide necessary treatment so that in general the wildlife may be returned to the wild. When the rescued wildlife is not releasable, wildlife rehabilitators may transfer the animal to a zoo or other educational institution. There are currently about 150 federally and state-permitted wildlife rehabilitators within the four BCRs, including two raptor rehabilitation centers in Wyoming.

Some rehabilitation centers in Wyoming and Colorado report rehabilitating and releasing 20 to 40 percent of the eagles brought to them (USFWS 2015a). Organizations associated with these centers often sponsor research evaluating the effectiveness of rehabilitation. This form of augmentation to wild populations has demonstrable success for peregrine falcon (Minnesota), whooping crane (Wisconsin), bison (from a captive-bred population in Minnesota), California condors (Arizona, California), and wolves (Michigan). Additionally, many injured eagles are rehabilitated and reintroduced every year (Primack 2014). Rehabilitation of injured birds requires significant effort for reintroductions to be successful. In some cases, rehabilitated birds need to be taught how to conduct activities they need to survive and require effort to develop their fitness so that they can survive in the wild.

Statistics concerning the success of raptor reintroduction into the wild are difficult to find. We examined 15 rehabilitation programs and interviewed four facilities and did not obtain information on long-term survival success rates. Sweeney et al. (1997) evaluated morbidity and survival in rehabilitated and wild peregrine falcons and found survival rates of 20 percent for rehabilitated peregrines up to 3 months after release, 14 percent survival up to 1 year, and survival rates similar to wild falcons beyond 1 year. Fijardo et al. (2000) had similar results when comparing local wild populations of barn owls to rehabilitated and released individuals. They found that released individuals showed greater numbers of fatalities due to starvation and lower life expectancy. They also found a higher number of fatalities for about the first 4 weeks after release, but then survival resembled fatality patterns of wild populations.

Most injured eagles that we are aware of are rehabilitated at federally and state-permitted facilities. However, existing facilities might not be able to keep up with the need, and some evidence suggests that not all injured eagles are getting access to rehabilitation and subsequent opportunity for rerelease into the wild. This mitigation option would involve

providing funding for expansion of existing wildlife rehabilitation services. Expansion of services could include expanding the network of federally and state-permitted rehabilitation centers and eagle rehabilitators in the four BCRs, or expanding the transportation network so that injured eagles could be transported to wildlife rehabilitation centers more quickly and safely. The Carbon County Planning and Development Department has expressed support for the expansion of existing wildlife rehabilitation services in Wyoming.

2.2.3 Alternative 3 – Issue ETPs for Only the Sierra Madre Portion of the CCSM Phase I Project

2.2.3.1 Overview

We received numerous comments during the EIS scoping process requesting that we examine a different development scenario from the one proposed by PCW as part of Alternative 1 (Proposed Action) (that is, the CCSM Phase I Project, which consists of 500 turbines). To issue any ETP, we must analyze a specific project and determine whether the ETP application meets our criteria for issuing a permit based on analysis of that project. Only after required avoidance, minimization, mitigation, and other criteria are met can a specific project permit be issued authorizing take for the number of predicted eagle fatalities. In other words, we must analyze a project with specific wind turbines and layout rather than issuing a permit allowing a level of take and then devising a project layout to meet that permit.

We will not determine whether to issue ETPs for the CCSM Phase I Project as proposed by PCW until completion of the ETP application review and the associated NEPA processes. At this time, it is possible that we would issue ETPs for the CCSM Phase I Project under Alternative 1 (Proposed Action) or that we would deny the ETPs under Alternative 4 (No Action: Denial of ETPs). However, it is also possible that we would determine that the applications would meet the criteria for issuing ETPs, but not at the scale of the proposed project, and the applicant would need to present an alternative project scenario. Therefore, we are considering Alternative 3 (Issue ETPs for Only the Sierra Madre Portion of the CCSM Phase I Project) as an example of a different development scenario and the potential federal action if, through the ETP application review process, it is determined that Alternative 1 (Proposed Action) does not meet ETP criteria. During development and preliminary assessment of PCW's ECP, the impacts and consequent avoidance and minimization measures for the Sierra Madre WDA were developed and analyzed independently of that for the Chokecherry WDA. Therefore, issuing ETPs for only the Sierra Madre portion of the CCSM Phase I Project could be evaluated in this EIS as an independent potential project that could be submitted by PCW for our review in the future. We chose to analyze the Sierra Madre WDA as an example of a smaller project rather than the Chokecherry WDA because the Sierra Madre WDA has a higher potential for wind energy production.

Alternative 3 would be eligible for selection only if we were to determine that Alternative 1 (Proposed Action) does not meet regulatory criteria for a programmatic ETP, but that this smaller project did meet ETP criteria. Alternative 3 would also be eligible for selection only if the applicant submitted ETP applications for only the Sierra Madre portion of the CCSM Phase I Project. If our review determines that PCW's applications for ETPs for Alternative 1

(Proposed Action) meet the ETP criteria, Alternative 3 would not be selected. We will not reach a decision regarding the ETP applications until the NEPA process is concluded.

2.2.3.2 Covered Activities

Activities covered under the ETPs for Alternative 3 would include the Phase I activities related to only the Sierra Madre WDA and all infrastructure components of the CCSM Phase I Project. Phase I of the Sierra Madre WDA would include 298 turbines in the areas occurring west of WYO 71/CR 401 (see Figure 2-3 and Table 2-8). Along with the turbines themselves, Phase I development of the Sierra Madre WDA would include roads, electrical systems (including electrical lines and substations), operation and maintenance buildings, meteorological towers, utilities, and temporary features within the Sierra Madre portion of the Phase I boundary (see Attachment A, Figure 3.2). Alternative 3 would include 3,237 acres of initial clearing and grading areas (27 percent less than under Alternative 1), 658 acres of long-term modification areas (22 percent less than under Alternative 1), and 288 acres of activity areas (35 percent less than under Alternative 1).

Table 2-8. Wind Turbines in the Sierra Madre Wind Development Area of the CCSM Phase I Project in Wyoming

Region	Number of Turbines
McCarthy[a]	69
Pine Grove[a]	72
Upper Miller Hill	157
Sierra Madre WDA/Total	**298**

Note:
[a] Collectively referred to as Lower Miller Hill

All additional infrastructure components associated with the CCSM Phase I Project (the Phase I Haul Road and Facilities, West Sinclair Rail Facility, and Road Rock Quarry, as discussed in Section 2.2.1.2.4) would be covered under the ETPs for Alternative 3.

2.2.3.3 Eagle Fatality Prediction

We used data collected by PCW and the proposed Phase I wind turbine layout to predict eagle fatality for Phase I of only the Sierra Madre WDA. As described in Section 2.2.1.3, the number of estimated eagle fatalities was calculated by using long-watch data collected at the Phase I development and infrastructure areas from April 2011 to July 2012, and 0.5 mile fixed-point count data collected from August 2012 to August 2013 (see Attachment C, the USFWS eagle fatality prediction analysis executive summary, for additional detail).

The predicted take from Alternative 3 (Issue ETPs for Only the Sierra Madre Portion of the CCSM Phase I Project) is 1 bald eagle and 7 to 10 golden eagles annually, depending on turbine blade size, as shown in Table 2-9.

Table 2-9. Alternative 3 Estimated Annual Programmatic Eagle Take for the CCSM Phase I Project in Wyoming

Species	394-foot-diameter (120-meter-diameter) Wind Turbine Blade	338-foot-diameter (103-meter-diameter) Wind Turbine Blade
Bald Eagle	1	1
Golden Eagle	10	7

In addition to the programmatic take predicted for Phase I of only the Sierra Madre WDA, the same level of disturbance take from construction of the Phase I wind turbine development and infrastructure components for the CCSM Phase I Project and the infrastructure components, as described under Alternative 1 (Proposed Action) in Section 2.2.1.3, would likely occur under Alternative 3 as well.

Construction associated with Alternative 3 would include construction of only the Sierra Madre portion of the Phase I wind turbine development for the CCSM Phase I Project and all the infrastructure components of the CCSM Phase I Project. As a result, construction would be predicted to disturb the five eagle nests described in Section 2.2.1.3. As under Alternative 1 (Proposed Action), the standard permit for Alternative 3 would thus cover disturbance take of eight adult golden eagles and two adult bald eagles on an annual basis during construction of the Phase I wind turbine development and infrastructure components.

2.2.3.4 Permit Stipulations

We would attach stipulations to the standard and programmatic ETPs issued for construction and operation activities, respectively, associated with only the Sierra Madre portion of the CCSM Phase I Project. These stipulations would include the permit duration; EACPs as well as additional BMPs; monitoring; adaptive management; and compensatory mitigation requirements, as discussed in Section 2.2.1.4.

The ETP issued for disturbance take during construction of the Sierra Madre portion of the CCSM Phase I Project and construction of the infrastructure components would take effect immediately upon permit issuance and would cover all construction and site development activities until the Sierra Madre portion of the CCSM Phase I Project is operational. Construction is anticipated to begin in 2016 and be complete by 2020. Any construction occurring prior to securing an ETP for disturbance take associated with construction activities would still be subject to compliance with BGEPA.

The duration of the programmatic ETP for only the Sierra Madre portion of the CCSM Phase I Project would be 5 years. The permit would take effect once the first turbine is put into operation, which is anticipated to be in 2018, and would cover operation of all 298 turbines and ongoing operation of site infrastructure. Going forward, we assume that PCW would reapply for a programmatic ETP at 5-year intervals. We would review any reapplications we receive and make a decision about whether or not to issue successive programmatic ETPs. During the review process, we would reassess fatality rates,

effectiveness of measures implemented to reduce take, the appropriate level of compensatory mitigation, eagle population status, and other factors.

The protocols for post-construction eagle fatality monitoring and disturbance monitoring would be the same as described under Alternative 1 (Proposed Action); the post-construction eagle fatality monitoring program would be required to achieve a 95 percent level of certainty that permitted take is not exceeded.

For Phase I of the Sierra Madre WDA, the predicted recurring bald eagle take would not exceed calculated EMU take thresholds; therefore, no compensatory mitigation is required for bald eagles at this time.

Compensatory mitigation for golden eagles would be required under Alternative 3. We assume that mitigation under Alternative 3 would be similar to mitigation under Alternative 1 (Proposed Action) and would consist of retrofits to high-risk power poles to compensate for predicted golden eagle fatalities. Compensation would be based on Table 2-10.

Table 2-10. Required Compensatory Mitigation for Golden Eagle Take Under Alternative 3 of the CCSM Phase I Project in Wyoming

Wind Turbine Blade Diameter and Number of Turbines in Sierra Madre WDA of Phase I	Annual Permitted Take	Number of Poles to be Retrofitted to Achieve No-Net-Loss of Golden Eagles	
		Assuming 5 Years of Avoided Loss From Retrofitted Poles	Assuming 10 Years of Avoided Loss From Retrofitted Poles
394-foot-diameter (120-meter-diameter) Wind Turbine Blade			
298 turbines	10	2,556	1,373
338-foot-diameter (103-meter-diameter) Wind Turbine Blade			
298 turbines	7	1,889	1,015

2.2.4 Alternative 4 – No Action: Denial of ETPs

Under Alternative 4 (No Action), we would deny PCW standard and programmatic ETPs for construction and operation of the CCSM Phase I Project. We could deny the ETPs because the permit applications failed to meet one or more of several issuing criteria under 50 CFR 22.26 or because we have determined that the risk to eagles is so low that ETPs are unnecessary.

In addition to Alternative 4 (No Action) being a potential outcome of the permit review process, analysis of the No Action alternative is required by CEQ regulation (40 CFR 1502.14) and provides a baseline against which to compare the environmental impacts of the Proposed Action and other reasonable alternatives. ETPs are not required in order for PCW to construct and operate a wind energy facility. However, any unpermitted eagle take, if it occurs, would constitute a violation of BGEPA.

If we deny or do not issue ETPs to PCW for the proposed project, PCW may take one of two actions:

- PCW may decide not to construct the proposed project, which we refer to as the No Build scenario under Alternative 4.
- PCW may construct the proposed project, as approved by the BLM and other permitting agencies, without ETPs and without adhering to an ECP, which we refer to as the Build Without ETPs scenario under Alternative 4.

Each of these possible actions is described below.

2.2.4.1 No Build

If the CCSM Phase I Project were not constructed, existing land uses would be maintained. No wind turbines or infrastructure components would be constructed, and the ECP would not be implemented.

PCW's purpose of generating 1,500 MW of electricity from wind from the CCSM Phase I Project to serve 790,000 households in California, Nevada, and Arizona to help meet the renewable energy mandates of these states would not be met.

The goal of Secretarial Order 3285, which encourages development of renewable energy generation projects in the United States, would not be met by the CCSM Phase I Project if it were not constructed.

2.2.4.2 Build Without ETPs

If the CCSM Phase I Project were constructed without ETPs, the Phase I wind turbine development and infrastructure components would be built as described in the BLM-approved site-specific plans of development (SPODs) for the project and as described above in Sections 2.2.1.2 and 2.2.1.3. However, for purposes of this evaluation, we assume that many of our permit stipulations as described in the ECP and as outlined in Section 2.2.1.4 would likely not be implemented, including monitoring, adaptive management, compensatory mitigation, and EACPs. As a worst-case scenario of baseline impacts, we assume that none of our ETP stipulations would be implemented.

PCW would still be required to comply with BGEPA, and we could make a referral to the U.S. Department of Justice that PCW be prosecuted for any bald and golden eagles taken without a permit.

2.3 Alternatives Considered but Eliminated from Consideration

Alternatives to the Proposed Action that were assessed and dismissed from further consideration are discussed below. Alternatives were eliminated from consideration if they did not meet the alternatives screening criteria described in Section 2.1.1.

2.3.1 Full Site Build-Out (1,000 Turbines)

The BLM FEIS analyzed the full build-out of the CCSM Project, which would consist of 1,000 turbines. During the development of BLM's NEPA documents, BLM and PCW incorporated a phased construction sequence. By limiting the construction to a shorter time period, impacts on wildlife, soils, water, and vegetation (including weeds) would be reduced. The phased construction sequence would also allow BLM to use an adaptive management approach, monitoring impacts and modifying the required mitigation measures to best protect wildlife and habitat as construction proceeds.

The BLM ROD described the process for subsequent NEPA analysis to occur. The BLM ROD did not authorize site-specific construction, but stated that PCW was expected to request separate authorizations before construction would be approved. The separate authorizations consist of ROW grants to implement SPODs. BLM would conduct subsequent NEPA analysis, tiered to the analysis conducted in the BLM FEIS, prior to issuance of any ROW grants.

In its ETP applications, PCW proposes to construct 500 turbines in the western portions of the Chokecherry and Sierra Madre parcels, in the areas known as Miller Hill and West Chokecherry, which comprise the highest-quality wind resources of the CCSM area. The Phase I turbines in the Sierra Madre WDA would be constructed first, followed by the Phase I turbines in the Chokecherry WDA. If PCW were to pursue a full build-out of 1,000 turbines, the company would need to submit a new programmatic ETP application covering the full build-out.

CEQ guidance from 2014 states that the requirement of alternatives development is "meant to ensure that agencies consider approaches with no, or less, adverse environmental effects as compared to the Proposed Action" (79 FR 77801, December 24, 2014). The full build-out of 1,000 turbines would result in greater adverse environmental effects than the Proposed Action. Additionally, this alternative is not consistent with the programmatic ETP application we have received. Consequently, we eliminated this alternative from further consideration.

2.3.2 ETP Duration

During scoping, we received several comments that expressed general concern over the length of 30-year permits. Some commenters suggested that permit tenure should not exceed 5 years until critical uncertainties regarding risk prediction are addressed and effectiveness of both conservation practices and mitigation measures are proven.

PCW originally requested a programmatic 30-year ETP in its application. However, as a result of a recent court decision (*Shearwater v. Ashe*, Case No. 14-cv-02830-LHK, N.D. Cal. Aug. 11, 2015), which set aside the permit duration part of the rule authorizing 30-year permits, the maximum duration for ETPs is 5 years. In consultation with PCW, we decided to process PCW's original 30-year application as a 5-year application and did not require PCW to submit a new application.

If an ETP is issued for the proposed project, it will be for a duration of no more than 5 years. After the first 5 years, PCW may elect to reapply for another programmatic ETP for

continued operation of the CCSM Phase I Project. We will review any reapplication submitted to us, and at the time of review, we will reassess fatality rates, effectiveness of measures to reduce take, the appropriate levels of compensatory mitigation, and eagle population status. Depending on our findings during permit review, we may make changes to any future permit issued for the CCSM Phase I Project, including any of the following:

1. Update the fatality predictions for the facility.
2. Require implementation of additional conservation measures.
3. Update monitoring requirements.
4. Revise compensatory mitigation requirements.
5. Revise the advanced conservation practices.
6. Deny the permit.

Because we cannot issue ETPs with a duration of more than 5 years, we have eliminated from consideration an alternative that would assess variable ETP durations.

2.3.3 Macrositing (Consideration of Development Outside of CCSM Boundaries)

An alternative evaluating wind power development at a site outside of the CCSM boundaries, macrositing, was eliminated from consideration because it is not reasonable to request that PCW acquire a different site, and because PCW is seeking permits from other federal and state agencies (that is, BLM and the State of Wyoming) for a project at the proposed location. Our consideration of a different project would be counter to the BLM ROD for the CCSM Project (BLM 2012b) and BLM's site-specific environmental assessments (EA1 and EA2) evaluating the CCSM Phase I Project and infrastructure components. Additionally, this alternative is not within our authority as an action agency reviewing the ETP applications. Consequently, we have eliminated a macrositing alternative from further consideration.

2.3.4 Micrositing (Adjustments to Turbine Numbers and Layouts within CCSM Boundaries)

During the scoping process, several commenters noted that development associated with the CCSM Phase I Project should occur in previously modified areas and areas with the fewest environmental impacts, and that turbines should not be located in areas with high avian use, near known raptor nests, near breeding areas, near abundant prey areas, within core habitat for greater sage-grouse, or near greater sage-grouse leks. Additional specific comments received on siting included the following:

- Move the CCSM Project to Bolten Flats.
- Avoid Miller Hill.
- Avoid the Atlantic Rim located to the west of the CCSM Project area.
- Use WYO 71 as the haul road.
- Avoid turbines along the southern border of the Chokecherry WDA and the southwestern boundary of the Sierra Madre WDA.
- Avoid development of 0.5 mile on either side of the Continental Divide National Scenic Trail (CDNST).
- Avoid all greater sage-grouse core areas and use a buffer of 0.6 mile to protect habitat integrity near any lek.

- Consider an alternative that shields the viewsheds of the CDNST and the Overland Historic Trail from the CCSM Project.

Micrositing of the wind turbine layout and configuration within the CCSM boundary was eliminated from further consideration because PCW worked with us during pre-application coordination to develop eagle and other wildlife avoidance and minimization measures, which are documented in the ECP (see Section 2.2.1.3.2 and Attachment A).

PCW's originally proposed project would not have placed turbines on Sage Creek Rim or in Lower Miller Hill or the Sage Creek Basin. Turbines would have been placed throughout the full extent of Upper Miller Hill, including within the Red-Rim Grizzly Wildlife Habitat Management Area (WHMA). As PCW developed avoidance and mitigation measures in cooperation with BLM and us, turbines were removed or relocated as described in detail in the ECP, Chapter 6 (see Attachment A). Hundreds of proposed turbines were relocated or removed during six project redesign efforts. Major avoidance and mitigation measures for the Proposed Action included:

- Considering alternative sites for turbines to reduce risk to eagles and other birds.
- Removing or relocating specific potential wind turbine sites using site-specific eagle and avian use data.
- Modifying, removing, or relocating infrastructure components using site-specific eagle and avian use data.

Greater sage-grouse core areas have been avoided, and the proposed turbine sites have been arranged into rows to be consistent with our ECP guidance. Turbine no-build areas have been defined, which have eliminated turbine sites in the areas where about 80 percent of eagle use of the CCSM Project area has been observed. The turbine layout has been refined to avoid some documented avian use areas, movement corridors, and nesting and foraging habitats. Turbine sites have also been removed from the Red Rim-Grizzly WHMA located west and south of the Miller Hill portion of the Sierra Madre WDA.

Micrositing of the wind turbine layout as it relates to minimizing impacts on eagles and other wildlife is incorporated into the CCSM Phase I wind turbine development SPOD (PCW 2014a). PCW has determined that additional micrositing is not feasible. Our permit review is considering whether the current project layout avoids impacts on eagles sufficient to meet ETP criteria. Additional micrositing is therefore eliminated from consideration as an alternative.

2.3.5 Additional Avoidance and Minimization Measures

Additional avoidance and minimization measures include site avoidance measures (placing buffers around resources used by eagles), turbine avoidance measures (altering the size, speed, or color of turbines), and operational mitigation (removing or curtailing the operation of turbines where a high number of fatalities have occurred).

Several commenters noted that priority should be given to additional strategies for avoiding and minimizing eagle take during operations and to measures for excluding specific areas

from development. Suggested avoidance strategies included configuring wind turbines to avoid high avian use areas and buffers around known eagle nests and breeding areas, and removing especially hazardous turbines that cause repeated fatalities or overlap with high avian use areas. Avoidance and minimization measures that avoid development in or near site resources are discussed in detail as part of Alternative 1 (Proposed Action) in Section 2.2.1.3.2 and under micrositing in Section 2.4.4. We have worked with PCW to site turbines and other project features to reduce effects on eagles. The proposed configuration of wind turbines and the buffers around known eagle nests are based on our discussions with PCW. Our review of the permit application will determine whether the current turbine layout avoids impacts on eagles to the maximum extent possible.

We may consider suggested minimization strategies such as operational curtailment and an increased "cut-in" speed to minimize impacts on bats and migratory birds as part of the adaptive management process of an ETP, should one be issued. However, we have eliminated consideration of additional avoidance and minimization measures as a stand-alone alternative in this EIS.

2.3.6 Mitigation

Many scoping comments urged us to develop a full suite of mitigation options to avoid eagle take before it occurs. Avoidance and minimization measures that reduce take before it occurs are not considered compensatory mitigation measures under BGEPA because avoidance and minimization measures must already be implemented to the maximum degree practicable before take occurs. Avoidance and minimization measures under consideration as part of Alternative 1 (Proposed Action) are discussed in Section 2.2.1.3.2. Avoidance and minimization measures dismissed from further consideration are discussed in Section 2.3.5.

Compensatory mitigation measures that are intended to be implemented as a result of unavoidable take are discussed in the subsections below. During the scoping process, several commenters suggested compensatory mitigation measures that we are considering as part of Alternative 2, as discussed in Section 2.2.2. Additional compensatory mitigation suggestions that are eliminated from further consideration, and the rationale for their elimination, are discussed below.

2.3.6.1 Expand Captive Eagle Breeding Programs

Captive breeding programs have been used successfully to create experimental flocks of endangered whooping cranes in Wisconsin and to keep the California condor from becoming extinct (Primack 2014). In some cases, active rearing programs are a tool used to augment wild populations of bird species (Steenberg 1981; Tennessee's Watchable Wildlife 2014). Successful programs use methods that are very time-intensive and costly, and require trained individuals who institute methods designed to keep birds from imprinting on, or becoming attached to, humans (American Eagle Foundation 2011).

At this time, we have issued a permit to only one facility in the United States for captive breeding of eagles; this permit is held by an individual of the Comanche Nation in Oklahoma. However, if there is a wild breeding population of a species, then captive

breeding is typically considered a last resort option for them. Therefore, this alternative was eliminated from further review.

2.3.6.2 Increase Public Education

Public education campaigns are initiated to heighten awareness of the current plight of a targeted resource. In this case, golden eagles would be the focus of a campaign to describe the species and the protection it is afforded, current sources of mortality, and identification of measures to prevent mortality, such as accidental shootings or trappings. Although no literature exists to further evaluate this option with regard to golden eagles, past public education campaigns have been credited with the elimination of dichlorodiphenyltrichloroethane (DDT) from ecosystems, have resulted in an increase in the North America population of bald eagles, and have increased populations of other predatory raptors (USFWS 2007a). This type of campaign could be initiated to advance the conservation of golden eagles in the four BCRs that are considered to comprise the CCSM golden eagle population. However, because there would be no way to calculate the benefits of a specific public education effort and correlate those benefits with reducing eagle mortality in a quantifiable manner, this alternative was dismissed from further evaluation.

2.3.7 Monitoring (Other than that in ECP)

Comments received during scoping regarding monitoring included the following:

- Incorporate detailed monitoring prescriptions and protocols in the ETP and the ECP, including stringent reporting requirements.
- Use avian radar technology for monitoring during and after construction.
- Monitor nesting success.
- Have monitoring be conducted by an independent third party of qualified observers.
- Require pre-construction monitoring to extend 10 miles outside the CCSM Project boundary and include a sufficient number of observation points to ensure that the entire CCSM Project area is evaluated.
- Require 3 years of post-construction fatality monitoring for 50 percent of turbines.
- Make monitoring and analysis data publicly available in real time.
- Develop a publicly available wildlife incidental reporting system that would include incidental reporting of eagle fatalities in the CCSM Project area.

Regulations for issuing an ETP under BGEPA require the applicant (PCW) to prepare and agree to comply with an ECP (78 FR 73704, December 9, 2013). The ECP prepared by PCW for the CCSM Phase I Project (see Attachment A) includes a comprehensive eagle monitoring plan, which we will review as part of the ETP applications to ensure that it meets our requirements. In addition, PCW has prepared a Phase I BBCS (see Attachment B) that includes monitoring for bats and birds other than eagles.

Because comprehensive monitoring would be a requirement of the ETPs, we have eliminated from consideration an alternative to monitoring other than what would be required as part of the ETPs.

2.3.8 Adaptive Management Strategies

Several commenters encouraged that we require, as part of an ETP, a robust adaptive management plan that incorporates the most recent and best techniques available for reducing eagle fatalities during the lifetime of the CCSM Project. Specific comments received on adaptive management strategies included the following:

- A Technical Advisory Committee should be established to oversee the adaptive management framework and implementation of ACPs.
- Specific thresholds for fatalities that would trigger additional adaptive management should be defined. The additional adaptive management measures also should be defined.
- Measures should include observer- or radar-triggered temporary turbine shutdown, seasonal curtailment, operational curtailment, and decommissioning of specific turbines.
- In the event that turbine designs that have significantly lower impacts on birds and bats or other minimization measures become available, the CCSM Project proponents should be required to change out old turbine designs or otherwise incorporate new lower-impact technologies.

If we issue ETPs for the CCSM Phase I Project, the ETPs will incorporate the ECP developed for the project (see Attachment A), which includes measures to avoid and minimize impacts on eagles, including removing and relocating wind turbines from areas with high potential for eagle take and seasonal curtailment of specific wind turbines in proximity to eagle nests (see the permit stipulations discussed in Section 2.2.1.4). In addition, as part of its 5-year reviews of the programmatic ETP, we would evaluate the need to require implementation of additional conservation measures and revisions to advanced conservation practices and mitigation measures (78 FR 73704, December 9, 2013). These measures could include additional seasonal restrictions and curtailments.

Adaptive management strategies would be considered as part of Alternative 1 (Proposed Action) on an as-needed basis. However, these strategies do not constitute a stand-alone alternative and were eliminated from further consideration as a separate alternative.

2.3.9 Different Technologies

During scoping, several commenters suggested that we consider other renewable energy development, such as solar panels, thermal energy, and installation of small wind turbines on existing buildings, as an alternative to the CCSM Phase I Project. Additionally, several comments requested that we consider different “bird-friendly” wind energy technologies, such as alternative turbine designs that may present a lower risk to eagles and other birds and additional bird deterrents, as part of the CCSM Phase I Project.

Assessing a renewable energy source other than wind power is beyond the scope of the ETP applications and counter to other federal permitting actions for the CCSM Project (BLM 2012a, 2014, 2016a).

Alternatives that evaluate technologies other than the wind turbines proposed by the applicant, including alternative "bird-friendly" wind turbine designs, were eliminated from further consideration because they are not technically feasible or commercially available. We are not aware of any published studies that demonstrate that alternative wind turbine designs result in fewer fatalities to birds or bats. Alternative wind turbines are not proven technology at this time and therefore are not a practicable alternative to the Proposed Action.

2.3.10 Issue Either Standard ETP or Programmatic ETP

We evaluated the feasibility of issuing only one ETP, either the standard ETP or programmatic ETP, without the other. The standard ETP would authorize unavoidable individual eagle take (including nest disturbance) during construction while the programmatic ETP would authorize unavoidable eagle take that may recur through the life of CCSM Phase I Project after implementation of EACPs. The two permits do not overlap. This alternative was considered but eliminated for the reasons presented in the subsections below.

2.3.10.1 Issue Standard ETP Only

The issuance of only a standard ETP would authorize individual eagle take during construction of the Phase I wind turbine development and infrastructure components for the CCSM Phase I Project, but not during the operation of the CCSM Phase I Project. Because a programmatic ETP would not be authorized, eagles taken during operation of the CCSM Phase I Project would result in violations of BGEPA, and the lack of EACPs and compensatory mitigation for eagle take could result in unacceptable reductions in eagle populations. This alternative would not be consistent with BGEPA or ECP guidance; therefore, we did not consider this alternative further.

2.3.10.2 Issue Programmatic ETP Only

The issuance of only a programmatic ETP would authorize eagle take during operation of the CCSM Phase I Project, including implementation of EACPs and compensatory mitigation, but would not authorize individual eagle take during construction. Activities associated with the construction of the Phase I wind turbine development and infrastructure components for the CCSM Phase I Project would occur within disturbance zones of bald and golden eagle nests. Eagle take, including nest disturbance, during construction would result in violations of BGEPA. Therefore, we did not consider this alternative further.