4.0 Environmental Consequences

This chapter describes the environmental consequences, also referred to as “impacts” or “effects”, of implementing the alternatives. Considering the existing conditions and trends of the affected environment (Chapter 3.0) and imposing the descriptions of the alternatives (Chapter 2.0), the types of impacts were identified and quantified to the extent practicable for the purposes of this EIS. The types of impacts disclosed include the following:

- **Direct Impacts –** The effects that are caused by the action and occur at the same time and place. Examples include the elimination of original land use due to the erection of a structure.
- **Indirect Impacts –** The effects that are indirectly caused by the action. They occur later or are farther removed in distance, but are still reasonably foreseeable and related to the action by a chain of cause and effect. Indirect impacts may reach beyond the natural and physical environment (e.g., environmental impact) to include growth-inducing effects and other effects related to induced changes to resource users (e.g., non-environmental impact).
- **Cumulative Impacts –** The effects that result from incremental impacts when added to other past, present, and reasonably foreseeable future actions regardless of what person or agency (federal or non-federal) undertakes those actions.

Direct and indirect impacts are discussed in Chapter 4.0 and the cumulative impact analysis is discussed in Chapter 5.0. The duration of impacts are considered as either short-term and temporary (up to 5 years) or long-term (beyond 5 years to the project life of 30 years or longer). General impacts of wind energy facilities to resources and resource uses are described in the *Final Programmatic Environmental Impact Statement on Wind Energy Development on Bureau of Land Management (BLM)-Administered Lands in the Western United States* (BLM 2005).

The impact analysis is designed to show relative differences in alternatives as they pertain to specific resources, resource uses, or social and economic features. It is not intended to predict the exact amount, timing, or location of effects that could occur should the alternative be selected for implementation. The numbers generated and used for comparison of impacts are approximated and intended for analysis purposes only. The exact location of project features cannot be determined until a final design is completed. Therefore, the exact areas of impact on specific resources, resource uses, or social and economic features are estimates based on the best available information at the time of this writing.

Each resource section includes a discussion of the resource-specific analysis area, relevant management considerations, significance criteria, and assumptions used in the analysis, followed by the direct and indirect impacts of each alternative. Following the impact analysis, each resource includes discussions on mitigation and mitigation effectiveness, residual impacts, irreversible and irretrievable commitment of resources, and relationship between local short-term uses and long-term productivity.

Impacts for each alternative are described for the “alternative boundary”, which refers to a smaller boundary within the Application Area that was created specifically for each alternative based on constraints identified during the alternatives development process (these boundaries are discussed in Section 2.3 by alternative). The “conceptual area of development” is the area within each alternative boundary where development would most likely occur based on wind potential considerations and environmental constraints (discussed in Section 2.2.1).

4.1 Impacts to Air Quality

Impacts to air quality include increases in criteria pollutants including fugitive dust emissions, emissions of hazardous air pollutants and GHG emissions. Local effects are analyzed within 5 km of the boundary; cumulative effects are analyzed within 300 km of the boundary. Generally, minor surface-based emissions do not have noticeable effects in areas beyond 5 km. Visibility impacts to Class I areas are analyzed at much greater distances. **Table 4.1-1** lists the relevant management considerations for air quality.

Table 4.1-1 Relevant Management Considerations for Air Quality

Resource Topic	Management Considerations
NAAQS	Compliance with NAAQS and state standards
Prevention of Significant Deterioration (PSD)	PSD and PSD increments
Visibility	Federal guidelines for visibility impairment
Atmospheric Deposition	Federal guidelines for atmospheric deposition
GHG	Climate Change

Ambient air monitoring data show low concentrations for criteria pollutants (except ozone) in the area. Taking into account the emission information estimated for this analysis and project-specific air quality analyses conducted in the area, such as Desolation Flats and Atlantic Rim, the BLM concludes that increases in concentrations of CO, NO_X, SO_2, PM_{10}, and $PM_{2.5}$ in the Application Area would be unlikely to cause any exceedence of federal or state ambient air quality standards (BLM 2008b).

Assumptions used in this analysis include:

- Since other visibility studies have been completed in the region, the results of those studies and the comparative emissions of criteria pollutants are used to qualitatively evaluate visibility impacts at these Class I areas. No visibility modeling was conducted.
- The comparative impacts of emissions from other analyses in the region are used to qualitatively estimate ozone impacts for the project. No ozone modeling for project development was conducted.
- The analysis discusses compliance with state and NAAQS. Since the project does not constitute a PSD source, the analysis does not address PSD increment consumption.

4.1.1 Impacts to Air Quality from the No Action

There would be no project specific air quality impacts from the No Action Alternative since there would be no project sources of emissions. Although the proposed project would emit low levels of pollutants principally from mobile sources during construction and operation, the net impact of the project would be to improve atmospheric conditions since the generation of electricity from wind turbines would reduce the need for electricity generated in fossil fuel-fired power plants. No action would mean that a valuable renewable resource would not be tapped for power generation to augment fossil fuel-fired generation facilities.

4.1.2 Impacts to Air Quality from Alternative 1R, Applicant Proposed Alternative

Air Emissions

Construction emissions would occur during construction of access roads, preparation of WTG sites, erecting those WTG, and construction of the transmission line. Construction would involve the use of earth-moving equipment, including loaders, scrapers, bulldozers, shovels, and backhoes. WTG components and transmission line equipment, as well as electrical cable and other equipment and supplies would be delivered from the IRF to the project site by large trucks and semi-tractors. Large cranes are used to install WTGs. Emissions from these activities include fugitive dust and tailpipe emissions (CO, NO_X, VOCs, particulates, SO_2, and air toxics).

Maximum air pollutant emissions from the construction of each WTG would be temporary (i.e., occurring only during the construction period), would occur in isolation, and would not significantly interact with adjacent WTG locations. Since construction emissions would be temporary, and construction emissions are not from major stationary sources, PSD regulations, including increments are not applicable.

Approximately 5,156 acres would be disturbed during the first year for construction of the facility. Construction and reclamation activities are expected to continue for a total of four years. **Table 4.1-2** shows the net total number of acres disturbed during each year. Fugitive dust from construction activities and travel on project roads would be controlled by water trucks. An approximate conservative emission factor for construction activity operations is 1.2 tons/acre/month of activity. This value is most useful for developing estimates of overall emissions from construction scattered throughout a geographical area (USEPA 1995).

Table 4.1-2 Fugitive Dust Emissions from Construction

Project Year	Net Disturbed Acres[1]	Annual Fugitive Emissions[2]	
		PM_{10} (tons)	$PM_{2.5}$ (tons)
One	5,156	6,187	2,413
Two	893	1,071	418
Three	583	698	272
Four	589	707	276

[1] Source: PCW 2010a.

[2] Calculations shown in **Appendix H**, **Table H-1**.

Fugitive dust emissions from disturbed areas assume 6 months of construction each year and 50 percent dust controls with water applied twice a day as needed. Construction would contribute to fugitive dust emissions include personnel vehicle access, occasional road maintenance activities, ongoing reclamation/re-vegetation activities, and turbine maintenance and repair. Vehicle miles traveled (VMT) on project roads during construction are shown for each project year in **Table 4.1-3**.

Annual emissions of fugitive dust from each basic construction effort including road construction, WTG construction and electrical system construction are listed in **Table 4.1-4** for each project year.

Five concrete batch plants are proposed to provide about 400 cubic yards (cys) of concrete for the foundation for each wind turbine. Annual emissions from the concrete batch plant are shown in **Table 4.1-5** for each project year during the construction phase.

Table 4.1-3 Vehicle Miles Traveled on Project Roads During Construction

Construction Effort	Year One VMT (miles)	Year Two VMT (miles)	Year Three VMT (miles)	Year Four VMT (miles)
Road Construction	1,346,525	2,442,350	1,999,800	1,337,900
WTG Construction	0	3,047,075	3,658,675	4,166,250
Electrical System Construction	5,870,875	6,590,050	4,146,825	3,666,475
Total Construction	7,217,400	12,079,475	9,805,300	9,170,625

Calculations shown in **Appendix H**, **Table H-2**.

Source: PCW 2010a.

Table 4.1-4 Fugitive Dust Emissions from Roads During Construction

Construction Effort	Year One		Year Two		Year Three		Year Four	
	PM_{10} (tons)	$PM_{2.5}$ (tons)	PM_{10} (tons)	$PM_{2.5}$ (tons)	PM_{10} (tons)	$PM_{2.5}$ (tons)	PM_{10} (tons)	$PM_{2.5}$ (tons)
Road Construction	338	34	613	61	518	52	327	33
WTG Construction	0	0	845	85	959	96	1,053	106
Electrical System Construction	1,963	196	2,187	219	1,174	117	1,232	123
Total Construction Road Dust	2,300	230	3,645	365	2,650	265	2,611	261

Calculations provided in **Appendix H**, **Table H-2**.

Table 4.1-5 Annual Point Source Emissions from Concrete Batch Plants

Pollutant	Emissions (tons/year)			
	First Year	Second Year	Third Year	Fourth Year
VOCs[1]	0.35	0.67	1.37	0.84
NO_X[1]	4.37	8.38	17.23	10.50
SO_2[1]	0.29	0.55	1.14	0.69
PM_{10}	15.18	20.71	18.66	10.68
$PM_{2.5}$	7.75	10.65	9.94	5.71

[1] Engine Emissions.

Calculations provided in **Appendix H**, **Table H-3**.

It is assumed that:

- Five batch plants would produce 623,563 cys of concrete over the construction period, with 23.85 percent (148,704 cys) production during the first year, 32.25 percent (201,123 cys) the second year, 27.96 percent (174,371 cys) during the third year, and 15.94 percent (99,365 cys) during the fourth year. Emission factors are from USEPA air pollutant (AP)-42, Volume 1, 5th Edition Chapter 11.12, Table 11.12-2 for Concrete Batching. Batch plant emissions PM_{10} and $PM_{2.5}$ data include total engine and watch emissions. There are no other criteria emission factors for cement batch production in AP-42. Emissions from concrete batch engines also are included in **Tables 4.1-6**, **4.1-7**, and **4.1-8**.
- The concrete batch plants would require air permits from WDEQ. The air permit would provide enforceable limits and potential air pollution mitigation measures to reduce air emissions impacts from operation of the batch plants.
- Tailpipe emissions would occur from mobile sources including earth-moving equipment such as scrapers, loaders, bulldozers, and backhoes during construction of access roads and preparation of WTG sites as well as from pickup trucks and semi-tractor trailers. WTG components and transmission line equipment, as well as electrical cable and other equipment and supplies would be delivered by large trucks and semi-tractors. Large cranes are used to install WTG. Emissions from these activities include fugitive dust and tailpipe emission (CO, NO_X, VOCs, particulates, SO_2, and air toxics). Estimated project emissions are shown in **Table 4.1-6**.

Given these assumptions, construction engine emissions, the relatively small emission levels from the batch plants, and fugitive dust emissions are widely dispersed. A screen analysis shows that these emissions would not cause a violation of ambient air quality standards or degradation of regional air quality. Implementation of environmental protection measures during construction, including the utilization of dust control measures, posting and enforcing speed limits, and watering storage piles, would minimize impacts on air quality due to fugitive dust.

Hazardous Air Pollutants

The highest near-field impacts for Alternative 1R would occur during construction activities resulting from combustion of fuel in project construction equipment. The regulated hazardous air pollutants (HAPs) listed in Section 112 of the CAA that are emitted from construction of Alternative 1R are benzene, toluene, xylenes, acetaldehyde, formaldehyde, and propylene. Emissions of the remaining HAPs are orders of magnitude smaller. **Table 4.1-7** provides an estimate of project emissions of HAPs for each of the 4 years.

Table 4.1-6 Emissions of Criteria Pollutants from Construction Engine Sources

Project Year	Pollutant (tons)					
	CO	NO_X	SO_2	VOC	PM_{10}	$PM_{2.5}$
One	492	2,284	151	182	162	162
Two	885	4,109	272	327	292	292
Three	649	3,010	199	240	214	214
Four	557	2,583	171	206	183	183

Calculations provided in **Appendix H**, **Tables H-4** through **H-7**.

Source: PCW 2010a.

Table 4.1-7 Tailpipe Emissions of HAPs from Mobile Construction Sources

Pollutant	Year One (tons)	Year Two (tons)	Year Three (tons)	Year Four (tons)
Benzene	0.48	0.87	0.63	0.54
Toluene	0.21	0.38	0.28	0.24
Xylenes	0.15	0.26	0.19	0.17
Acetaldehyde	0.40	0.71	0.52	0.45
Formaldehyde	0.61	1.09	0.80	0.69
Propylene	1.33	2.39	1.75	1.60

Calculations provided in **Appendix H**, **Tables H-4** through **H-7**.

Source: PCW 2010a.

Table 4.1-8 Tailpipe Emissions of CO_2 from Mobile Construction Sources

Pollutant	Year One (tons)	Year Two (tons)	Year Three (tons)	Year Four (tons)
CO_2e	84,726	152,413	111,663	95,826

Calculations provided in **Appendix H**, **Tables H-4** through **H-7**.

Impacts at Class I and II Areas – Acid Deposition

Although the proposed project would emit low levels of NO_X and SO_2, which are the primary potential acid producing pollutants principally from mobile sources during construction and operation, the net impact of the project would be to improve atmospheric conditions since the generation of electricity from wind turbines would reduce the need for electricity generated in fossil fuel-fired power plants.

Impacts at Class I and II Areas – Visibility

Background visibility data are not available for the CCSM area, but visibility is considered to be very good. A standard annual visual range of approximately 250 km (155 miles) has been calculated for the Flat Tops Wilderness areas using data from the FLAG Phase I report (FLAG 2000). Although the proposed project would emit low levels of pollutants, principally PM_{10} and $PM_{2.5}$, as well as tailpipe emissions from mobile sources, the net impact of the project would likely improve atmospheric conditions since the generation of electricity from wind turbines would reduce the need for electricity generated in fossil fuel-fired power plants.

Impacts on Ambient Ozone Levels

Alternative 1R is unlikely to cause or contribute to the formation of regional ozone at detectable levels due to the low level of emissions of potential ozone forming compounds, including NO_X and VOCs that are shown in **Table 4.1-6**.

Greenhouse Gases

Annual construction engine emissions of GHGs (CO_2 equivalents, or CO_2e, which include CO_2, methane, and nitrous oxide [N_2O]) from construction engine sources are shown in **Table 4.1-8**. The total GHG emissions from construction of Alternative 1R would be a negligible contribution to net global emissions. In the final regulation on greenhouse gas permitting, the USEPA considers a source that emits more

than 100,000 tpy of CO_2e to be a major source and requires a stationary source that emits more than 25,000 tpy to report their emissions. An equivalency calculation indicates that the total CO_2e emissions from construction of Alternative 1R in the first year would release about the same amount of CO_2e as the energy use for 1,436 average households in the U.S.[1]

Upon completion, the 2,000-3,000 MW capacity of the proposed project would replace emissions by other electrical grid power generation by 1,400 to 2,100 tons of CO_2 per year.

4.1.3 Impacts to Air Quality from Alternative 2, Checkerboard Only

Impacts from Alternative 2 would be about the same as from Alternative 1R.

4.1.4 Impacts to Air Quality from Alternative 3, No Miller Hill or Sierra Madre

Impacts from Alternative 3 would be about the same as from Alternative 1R.

4.1.5 Impacts to Air Quality from Alternative 4, Private Lands Only

Impacts from Alternative 4 would be about the same as from Alternative 1R.

4.1.6 Mitigation and Mitigation Effectiveness

No mitigation would be required for any of the alternatives.

4.1.7 Residual Impacts

Fugitive dust emissions resulting from travel to service the WTGs on unpaved roads would occur during the lifetime of the project, but these impacts would be temporary and limited in extent.

4.1.8 Irreversible and Irretrievable Commitment of Resources

Air quality impacts in the Application Area would not be irreversible. Once activities to service the WTG are ended the air quality would return to its natural state.

As the impacts of emissions are widely dispersed due to the spatial extent of the project, those impacts will be well below the ambient standards and would not produce a detectable effect on vegetation or grazing. The deposition of dust on vegetation may be noticeable at times, but is short-lived during construction. In a naturally windy environment plants and air quality conditions are commonly exposed to dusty periods, but deposition is alleviated by the windy periods, and by the natural conditioning of the vegetation to windy and dusty conditions.

4.1.9 Relationship between Local Short-term Uses and Long-term Productivity

The various construction activities authorized under lands and realty management (such as wind power, communication sites, transmission lines, and pipeline projects) would produce emissions of particulate matter. Soil disturbance and travel on unpaved roads are the main causes of the emissions. Tailpipe emissions from vehicular travel and emissions from equipment use would result from construction activities. Short-term impacts from fugitive dust may affect the recreational enjoyment of wildlife viewing, vistas, and other recreational aspects of visiting the vicinity of the proposed project.

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[1] Based on 59 tpy per U.S. household. The Hinkle Charitable Foundation. wwwthehcf.org/emaila.5.html.

4.2 Impacts to Cultural Resources

4.2.1 Analysis Area

The analysis area for cultural resources is the area of potential effect (APE). Under Section 106 of the NHPA, the APE is defined as "those areas in which impacts are planned or are likely to occur. Specifically, the APE is defined as the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if any such properties exist. Additionally, the APE is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking (36 CFR 800.16[d])."

The APE should include:

- All alternative locations for all elements of the proposed project;
- All locations where the proposed project may result in disturbance of the ground;
- All locations from which elements of the proposed project (e.g., wind turbines, substations, transmission lines, or land disturbance) may be visible or audible;
- All locations where the proposed project may result in changes in traffic patterns, land use, public access, etc.; and
- All areas where there may be indirect as well as direct effects.

For the proposed CCSM Wind Energy Project, the APE for direct and indirect impacts encompasses the Application Area; the APE for visual impacts includes the Application Area plus a 5-mile buffer.

4.2.2 Method of Analysis

The analysis of potential impacts to cultural resources is based on review of existing literature and information provided by the Wyoming SHPO and BLM. Potential effects are quantified where possible. In cases where quantitative data are not available, best professional judgment or qualitative assessments are used to describe impacts.

BLM management and protection of cultural resources is viewed as an integrated system of identifying and evaluating cultural resources, deciding on their appropriate uses, and administering them accordingly, both on public lands and on other lands where BLM decisions could affect cultural resources. The objectives of this integrated system are:

- Protect and preserve in place representative examples of the full array of cultural resources on public lands for the benefit of scientific and public use by present and future generations.
- Ensure that cultural resources are given full consideration in all land-use planning and management decisions.
- Manage cultural resources so that scientific and socio-cultural values are not diminished, but rather are maintained and enhanced.
- Ensure that the BLM's undertakings avoid inadvertent damage to cultural resources both federal and nonfederal.

These objectives are the basis for BLM's approach in analyzing the effects of the proposed project on important cultural resources, including resources of concern to tribal groups, and ultimately for protecting these resources. The BLM's relevant management considerations are provided in **Table 4.2-1**.

Table 4.2-1 Relevant Management Considerations for Cultural Resources

BLM Rawlins RMP and ROD (2008)
Management Goals • Preserve and protect cultural resources to ensure that they are available for appropriate uses by present and future generations. • Reduce imminent threats from natural or human-caused deterioration or potential conflict with other resource uses. • Promote and maintain a working relationship with Native American tribes.
Management Actions • Where the integrity of setting contributes to NRHP eligibility, management actions resulting in visual elements that diminish the integrity of the property's setting will be managed in accordance with the Wyoming State Protocol and BMPs (Appendix 5 of the Rawlins RMP [2008]). • Implement protection measures for sacred or sensitive sites as determined through consultation with Native American tribes. • Surface disturbing activities will not be allowed within 0.25 mile of a cultural property or the visual horizon, whichever is closer, if the setting contributes to NRHP eligibility.

The impact analysis of cultural resources is based on the following assumptions.

- Class III field inventories would be conducted for all proposed disturbance areas prior to project construction.
- A Class II sample survey of selected areas would be conducted to identify potential sites of traditional, cultural, and religious importance to Native American groups.
- The number of sites that would be impacted by the proposed project is directly correlated with the degree, nature, and quantity of surface disturbance within the APE.
- Protection of cultural resources would occur in accordance with SHPO coordination requirements and other federal regulations.
- Places of cultural and religious importance to Native Americans, including traditional cultural properties (TCPs), would be protected in accordance with tribal consultation coordination requirements and other federal regulations.
- The values that render a cultural resource eligible for the NRHP would dictate what type and kind of impacts are of concern.
- Formal consultation with Native American tribes to identify places of cultural and religious importance to the tribes, including TCPs, would take place throughout the NEPA process and up to project completion.
- If a cultural resource has been determined by the BLM and SHPO as not eligible for inclusion in the NRHP, it is not a historic property for purposes of the NHPA.
- Based on previous inventories in the analysis area, site density is projected to be 1 site every 352 acres.

4.2.3 Significance Criteria

Impacts are considered significant if management actions result in effects to properties listed or determined eligible for inclusion in the NRHP or considered important to Native American groups as measured by:

- Physical destruction or alteration of a property or relocation from its historic location;
- Isolation or restriction of access;
- Change in the character of the property's use or of physical features within the property's setting, or the introduction of visible, audible, or atmospheric elements that are out of character with the significant historic features of the property;
- Neglect that leads to deterioration or vandalism; and
- Transfer, sale, or lease from federal to non-federal control, without adequate and legally enforceable restrictions or conditions to ensure the preservation of the historic significance of the property.

Significance, under NEPA, is detailed in 40 CFR 1508.27 and is distinct from archaeological significance. Archaeological significance is measured by four categories defined by 36 CFR 60.4:

"The quality of significance in American history, architecture, archaeology, and culture present in districts, sites, buildings, structures, and objects of state and local importance that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and that:

A. Are associated with events that have made a significant contribution to the broad patterns of our history;

B. Are associated with the lives of persons significant in our past;

C. Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

D. Have yielded, or may be likely to yield information important in prehistory or history" (36 CFR 60.4).

4.2.4 No Action Alternative

Under the No Action Alternative, the proposed project would not be implemented. As a result, none of the potential impacts to cultural resources as identified for the proposed project would occur. However, additional knowledge of local or regional prehistory of the Application Area that would have been obtained through data recovery would not be collected.

4.2.5 Alternative 1R, Applicant Proposed Alternative

4.2.5.1 Potential Effects

A total of 467 previously recorded prehistoric and historic sites were identified in the Application Area as a result of the files search. The 467 sites include 286 prehistoric sites, 83 historic sites, 93 multicomponent sites consisting of both prehistoric and historic components, and 5 sites of unknown cultural affiliation. The majority of prehistoric sites consist of open camps/occupation sites, lithic scatters, and stone features. Historic sites predominately are debris scatters followed by rock cairns, roads, bridges, mines, and stock herding camps.

The types and numbers of NRHP-eligible sites that could be impacted by Alternative 1R are unknown at this time. Class III cultural resources field inventories of the Application Area have not been

conducted as of this date, but would be completed prior to project construction. Therefore, the following paragraphs provide only a qualitative assessment of impacts that could occur as a result of activities associated with project construction and operation.

Ground-disturbing activities, such as installation of WTGs; construction of access roads, underground electrical collection and communication lines, electrical substations, and overhead transmission lines; use of staging areas for storage equipment and supplies; and, future maintenance activities would have the potential to directly impact NRHP-eligible sites. These physical impacts could occur to both known sites and subsurface sites and could result in the vertical and horizontal displacement of soil containing cultural materials, damage to or destruction of artifacts and features, and loss of archaeological data. Indirect effects are caused by an undertaking and are later in time or farther removed in distance, but are still reasonably foreseeable. Potential indirect effects to cultural resources could include changes in erosion patterns due to construction, soil compaction, or vegetation removal; off-road vehicle traffic associated with construction or maintenance activities; and, vandalism, inadvertent damage, and illegal artifact collection due to increased access and numbers of people in Alternative 1R.

Visual impacts to historic properties where setting is an aspect of integrity, such as the Overland Trail, could occur as a result of introducing visual elements out of character with a property located within or adjacent to the Alternative 1R area. Introduction of structures such as the proposed WTGs and transmission line into an otherwise rural or natural setting could diminish the integrity of a property's historic features that contribute to its significance. Significant impacts would occur if the effects of project construction and operation could not be mitigated to eliminate adverse effects to the setting of a historic property.

The potential for the discovery of unanticipated cultural resources during construction activities exists within proposed disturbance areas and could result in an adverse effect. Unanticipated discoveries could result in displacement or loss (either complete or partial) of the discovered cultural resource. Displacement of cultural resources affects the potential to understand the context of the site and limits the ability to extrapolate data regarding prehistoric settlement and subsistence patterns. Potential impacts to unanticipated discoveries would be greater than impacts to resources previously identified and therefore avoided or subjected to data recovery because damage to discovered sites occurs prior to their recordation and evaluation thereby complicating mitigation procedures. The potential for significant impacts to unanticipated discoveries would be directly proportional to the amount of surface disturbance, estimated to be 7,221 acres of initial disturbance for Alternative 1R.

4.2.5.2 Resolution of Effects

In consultation with the Wyoming SHPO and interested tribes, the BLM would determine whether construction and operation of Alternative 1R would have an adverse effect on any historic properties listed or eligible for inclusion in the NRHP. If BLM determines that a property would be adversely affected, mitigation would be proposed in accordance with the PA. Mitigation may include, but would not be limited to, one or more of the following measures: 1) avoidance through changes in the construction or operational design; 2) data recovery, which might include the systematic professional excavation of a NRHP-eligible site; 3) the use of landscaping or other techniques that would minimize or eliminate visual effects on a site's setting; 4) development of interpretive materials; 5) Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER) or other agreed upon historic recordation process; or, 6) other mitigation determined by the BLM through consultation with the SHPO and interested tribes. Mitigation measures would be based on the types of impacts relevant to the site type.

Visual impacts to the Overland Trail and other historic properties where setting contributes to the NRHP eligibility and are located within the viewshed of the proposed project would be determined through viewshed analysis, on-site inspection, and photo inspection. The viewshed analysis would be

used to determine which physical feature of the proposed project would be visible from a property for which setting is an important aspect of integrity. Due to the large-scale nature of the proposed project, it is anticipated that adverse affects to the integrity of the Overland Trail's setting would occur. The applicant has committed to a 1 mile setback from the center of the Overland Trail as presently mapped (BLM 2008a) in all areas except sections listed in **Appendix C**, **Table C-2** – Summary of Applicant Committed Measures, Cultural-Historic Trails, where the BLM's RMP requirement of 0.25 mile was used. Although no surface disturbance would occur within a quarter mile of the trail, the WTGs would be visually obtrusive beyond this buffer.

Adverse effects to the integrity of the Overland Trail would be mitigated through implementation of BMPs, applicant-committed protection measures, and in accordance with the PA. Proposed mitigation measures to reduce visual impacts associated with the proposed project are listed under "Visual" in **Appendix C**, **Table C-4**, Proposed Mitigation Measures. If adopted, these measures also would reduce adverse effects to the Overland Trail and other historic properties where setting contributes to the property's NRHP eligibility. Compensatory mitigation, or compensating for an impact by replacement or providing substitute resources or environments, would be considered after application of other forms of on-site mitigation has been exhausted.

To minimize impacts associated with off-road vehicles, construction and maintenance traffic would be restricted to roads developed for the proposed project in compliance with applicant-committed protection measures. Use of other unimproved roads would be restricted to emergency situations. Vandalism, inadvertent damage, and illegal artifact collection are expected to occur due to increased access to and numbers of people in Alternative 1R.

As provided in the PA and applicant-committed protection measures, if any previously unknown archaeological sites, including human remains, are discovered during construction on public land, all construction activities would cease in the area of the discovery, and the BLM Authorized Officer would be notified of the find. Steps would be taken to protect the site from vandalism or further damage until the BLM Authorized Officer could evaluate the nature of the discovery, as outlined in the PA. Construction would not resume in the area of the discovery until the BLM Authorized Officer has issued a notice to proceed.

4.2.6 Alternative 2, Checkerboard Only

Under Alternative 2, there would be an increase in the distances between WTGs and WTG groups compared to Alternative 1R. Consequently, there would be a need for more miles of linear ancillary facilities such as access roads and overhead/underground collection lines resulting in an increase in surface disturbance. Initial surface disturbance for Alternative 2 is estimated to be 8,795 acres, 1,574 more acres than Alternative 1R. More surface disturbance would increase the potential for direct impacts to NRHP-eligible sites compared to Alternative 1R. The types of direct impacts that could occur would be the same as described for Alternative 1R.

Under this alternative, the proposed transmission line would parallel WY 71 where it crosses the Overland Trail, which would reduce effects to the trail's setting relative to the transmission line. However, the development footprint for Alternative 2 would be expanded to the east in the Chokecherry area and to the west in the Sierra Madre unit resulting in a greater visual contrast thereby increasing the potential for adverse effects to the setting of the Overland Trail compared to Alternative 1R.

The potential for indirect effects, such as illegal collecting of artifacts, vandalism, and inadvertent damage, would be the same as Alternative 1R.

Adverse effects to NRHP-eligible sites would be mitigated through implementation of BMPs, ACMs, and the PA.

4.2.7 Alternative 3, No Miller Hill or Sierra Madre

Under Alternative 3, the western and southern portions of the Sierra Madre unit would be excluded from development; however, WTGs would be distributed over a larger development footprint within the Chokecherry area and remaining portions of the Sierra Madre area compared to Alternative 1R. As a result, a greater amount of surface disturbance would occur due to increases in the length of linear facilities such as access roads and overhead/underground collection lines. Initial surface disturbance for Alternative 3 is estimated to be 8,504 acres, 1,283 more acres than Alternative 1R. Increased surface disturbance would increase the potential for direct impacts to NRHP-eligible sites to occur compared to Alternative 1R. The types of direct impacts that could occur would be the same as described for Alternative 1R.

Under this alternative, visual effects to the Overland Trail would be slightly reduced compared to Alternatives 1R and 2 due to the exclusion of the western and southern portion of the Sierra Madre area. Visual effects relative to the proposed transmission line would be the same as Alternative 2.

The potential for indirect effects, such as illegal collecting of artifacts, vandalism, and inadvertent damage, would be the same as Alternative 1R.

Adverse effects to NRHP-eligible sites would be mitigated through implementation of BMPs, applicant-committed protection measures, and the PA.

4.2.8 Alternative 4, Private Lands Only

Under Alternative 4, WTGs would be installed only on private land which would increase the development footprint compared to Alternatives 1R, 2, and 3. Expansion of the development footprint would require an increase in the total length of linear ancillary facilities such as access roads and overhead/underground collection lines resulting in increased surface disturbance. Initial surface disturbance for Alternative 4 is estimated to be 8,918 acres, 1,697 more acres than Alternative 1R. More surface disturbance would increase the potential for direct impacts to NRHP-eligible sites to occur compared to the other alternatives. The types of direct impacts that could occur would be the same as described for Alternative 1R.

Under this alternative, the location of WTGs and aboveground collector lines would be distributed over a larger development footprint. As a result of the expanded footprint, there would be an increase in the degree of contrast and areal extent of structures visible from the Overland Trail, which would increase adverse effects to the trail's setting compared to Alternatives 1R, 2, and 3. Visual effects relative to the proposed transmission line would be the same as Alternative 2.

The potential for indirect effects, such as illegal collecting of artifacts, vandalism, and inadvertent damage, would be the same as Alternative 1R.

Adverse effects to NRHP-eligible sites would be mitigated through implementation of BMPs, ACM's, and the PA.

4.2.9 Additional Mitigation

CR-1: To minimize unauthorized collecting of archaeological material or vandalism to known archaeological sites, PCW and its contractors, and all construction personnel, shall attend mandatory training and be educated on the significance of cultural resources and the relevant federal regulations intended to protect them.

Effectiveness: This measure would be highly effective with respect to project-related personnel. However, the measure would not apply to the public; therefore, the increase in road access would increase the potential for vandalism, looting, and destruction of sites.

CR-2: Additional mitigation measures would be included in the PA, which currently is being developed in coordination among the BLM, SHPO, ACHP, PCW, Indian tribes, and other interested parties.

Effectiveness: This measure would be highly effective in avoiding, reducing, and mitigating adverse effects to historic properties. The PA outlines the manner in which adverse effects would be mitigated and the roles and responsibilities of each signatory. The agreement stays in effect until all measures have been completed to the satisfaction of all parties who have participated in its development.

Note: Additional mitigation measures to reduce visual impacts associated with the proposed project are listed under "Visual" in **Appendix C**, **Table C-4**, Proposed Mitigation Measures. If adopted, these measures would reduce adverse effects to historic properties where setting is an important aspect of integrity.

4.2.10 Residual Impacts

Alternative 1R and action alternatives would result in the loss of cultural resources that are not eligible for the NRHP and located in proposed disturbance areas. Although these sites would be recorded to BLM standards and the information integrated into local and statewide databases, the sites ultimately would be destroyed by project construction. It is currently unknown how many NRHP-eligible sites would be affected by Alternative 1R or the other action alternatives. Applicant-committed protection measures and BMPs for cultural resource protection would be followed. Adverse effects to NRHP-eligible sites would be avoided or, if avoidance is not feasible, mitigated in compliance with the project PA. NRHP-eligible sites would be mitigated through implementation of data recovery, the use of landscaping to minimize visual effects, development of interpretive materials, or other mitigation determined by the BLM in consultation with the SHPO and interested Tribes. Since some of the cultural value associated with these sites cannot be fully mitigated, it is anticipated that residual impacts to these resources would occur.

Accidental disturbance, vandalism, and illegal collecting would be expected to increase in the analysis area as a result of increased access.

4.2.11 Irreversible and Irretrievable Commitment of Resources

NRHP-eligible sites could be irreversibly and irretrievably lost if inventory, avoidance, and/or mitigation efforts are not sufficient to identify and protect these sites.

4.2.12 Relationship between Local Short-term Uses and Long-term Productivity

The proposed project would result in the loss of short-term use and long-term productivity of cultural resources not eligible for the NRHP and located in proposed disturbance areas. For NRHP-eligible sites located in proposed disturbance areas that cannot be avoided, data recovery or other forms of mitigation would be conducted prior to project construction. The scientific information obtained through data recovery would be preserved for the long term. However, the site itself ultimately would be lost. There would be a long-term loss of cultural resources due to illegal collecting and vandalism associated with increased human activity in, and access to, the Application Area.

4.2.13 Native American Concerns

Specific statutes, regulations, and EOs guide consultation with Native Americans to identify cultural resources important to tribes and to address tribal concerns about potential impacts to these resources. These include the NEPA, NHPA, AIRFA of 1978, NAGPRA of 1990, EO 13007 (Indian Sacred Sites), and EO 13175 (Consultation and Coordination with Indian Tribal Governments). These statutes and regulations direct federal agencies to consult with Native American tribal leaders and others knowledgeable about cultural resources that are important to them and their way of life. Consultation is conducted for federal actions, such as decisions about the proposed project, that have

the potential to affect locations of traditional concern, areas where religious ceremonies are conducted, areas of traditional cultural uses, archaeological sites, and other modern and ancestral tribal resources.

A Class II sample survey has been conducted in the Application Area. The Class II sample survey was geared towards identifying sites of traditional, cultural, and religious importance to the tribes and was not limited to locations of proposed disturbance. Only sites and associated artifacts and features with potential tribal significance were fully recorded. Information derived from the survey will assist the BLM in assessing potential impacts of the proposed project on these sites, and in developing appropriate measures in consultation with interested tribal groups to mitigate potential impacts. Direct, indirect, and visual impacts that could occur to sites of traditional, cultural, and religious importance to the tribes as a result of the proposed project would be the same as described above for cultural resources.

Places of traditional, cultural, and religious importance to the tribes will be identified through consultation and cooperation with affected Native American tribes, as well as through the Class II sample survey and site-specific Class III cultural resources inventories. No surface disturbance would occur within or immediately adjacent to the boundary of a potential TCP or other site of tribal importance prior to completion of all Native American consultation. If necessary, a mitigation plan to mitigate potential impacts to a property of tribal importance would be developed by the BLM and SHPO as outlined in the PA. Tribal representatives would be asked to participate in the development of any mitigation plan.

Any information provided by tribal members concerning sites of traditional, religious, and cultural importance in the Application Area would remain confidential. At this time, consultation with the contacted Native American groups is ongoing and would continue up to and including project construction.

4.3 Impacts to Geological and Mineral Resources

The study area for analysis of direct and indirect impacts related to mineral resources is the proposed Application Area and associated ROWs. The cumulative impacts area for mineral resources is Carbon County. The study area for geological hazards for direct, indirect, and cumulative impacts is the Application Area and associated ROWs. **Table 4.3-1** lists the relevant management considerations for geological and mineral resources.

Table 4.3-1 Relevant Management Considerations for Mineral and Geological Hazards

Minerals
Management Objectives • Manage mineral resources from available public lands and federal minerals while minimizing the impacts to the environment, public health and safety, and other resource values and uses.
Management Goals • Provide opportunities for exploration and development of conventional and unconventional oil and gas, coal, and other leasable minerals. • Provide opportunities for exploration and development of salable minerals.
Management Actions • Existing oil and gas or other mineral rights will be honored. When an oil and gas lease is issued, it constitutes a valid existing right, and the BLM cannot unilaterally change the terms and conditions of a lease. • The lessee is subject to stipulations attached to the lease; restrictions deriving from specific, nondiscretionary statutes; and such reasonable measures needed to minimize impacts to other resources and resource users. Oil and gas lease stipulations may be modified or eliminated using the exception, modification, or waiver criteria. The BLM may impose reasonable measures (conditions of approval) to operational aspects of oil and gas development, including modification of siting or design of facilities, timing of operations, and specifying interim or final reclamation measures to control the manner and pace of development. • All lands open to oil and gas leasing consideration also will be open to geophysical exploration, subject to appropriate resource surveys, surface protection measures, adequate bonding, and adherence to State of Wyoming standards for geophysical operations. • With the exception of WSAs and some other SMAs, the remainder of the planning area is open to consideration for leasing of geothermal resources and non-energy leasable minerals. • Mineral material disposals are discretionary actions. Disposal will be considered on a case-by-case basis. • Surface disturbing activities will be intensively managed and will be subject to reclamation practices. Leases will be issued with stipulations to protect resource values. • There would be no management actions with regard to locatable minerals unless withdrawals are pursued.

Table 4.3-1 Relevant Management Considerations for Mineral and Geological Hazards

Geological Hazards
Management Objectives • Apply Wyoming Mitigation Guidelines to mitigate impacts from surface disturbance and apply to activities such as road or pipeline construction, range improvements, and permitted recreation activities. The guidelines are not land use decisions; rather they are examples of mitigation measures that could be applied, as appropriate, based on site-specific NEPA analysis for individual proposals.
Management Goals • Modify the operations of surface and other human presence disturbance activities as part of the statutory requirements for environmental protection. • Inform a potential lessee, permittee, or operator of the requirements that must be met when using public lands.
Management Actions • The Special Resource Mitigation Guideline is intended for use only in site-specific situations where general mitigation guidelines will not adequately address the concern. The resource value, location, and specific restrictions must be clearly identified. A detailed plan addressing specific mitigation and special restrictions will be required prior to disturbance or development and will become a condition for approval of the permit, plan of development, or other use authorization.

Sources:

Minerals: ROD, RMP, Final EIS for the RFO (BLM 2008a).

Geological Hazards: ROD, RMP, Final EIS for the RFO Appendix 1-Wyoming BLM Mitigation Guidelines for Surface Disturbing and Disruptive Activities (BLM 2008a).

For impacts to mineral resources to be deemed significant the following would have to occur (BLM 2008a):

- Access to minerals is in whole or part precluded by the proposed project, and
- Aggregate (sand and gravel) demand of the proposed project results in shortages of materials causing the new mineral materials disposals.

The following assumptions were used in the impact analysis for mineral resources:

- Potentially developable mineral resources underlie the proposed Application Area – all alternatives;
- Oil, natural gas, and unconventional hydrocarbon (coalbed and shale gas) resources may underlie the entire Application Area and are the only minerals considered in analysis of access to minerals;
- Minable coal resources may underlie portions of the Application Area, but the Kindt Basin has been considered an unlikely area of commercial coal development (BLM 2003a). Therefore, potential coal development is not considered in the analysis;

- Geothermal, locatable (e.g., uranium), and saleable minerals have low occurrence potential in the Application Area and are not considered in the analysis; and
- Construction of the project may increase demand for aggregate resources causing stress on local supplies.

For impacts involving geologic hazards to be deemed significant, the following would have to occur (BLM 2008a):

- Slope failure or the action of swelling clay that causes damage to project infrastructure.

The following assumptions were used in the impact analysis for geological hazards:

- The potential geological hazards that have been identified in the Application Area are landslides and bedrock containing bentonite layers with shrink-swell potential that may contribute to tower foundation problems; and
- Seismic hazards are considered to be low in the Application Area and were not considered in the impact analysis. No other geologic hazards are considered.

4.3.1 Impacts to Geological and Mineral Resources from the No Action

Under the No Action Alternative, present management of mineral resources would continue and no effects on access to oil and natural gas resources would occur other than the restraints placed upon the oil and gas industry in the Rawlins RMP ROD (2008a), BLM Onshore Oil and Gas Orders, the BLM Goldbook (USDOI and USDA 2006), and BMPs as recommended or imposed by the BLM, and individual lease stipulations.

Under the No Action Alternative, natural processes (movement of landslides) would occur and any adverse effects would impact existing infrastructure as may be present, mainly roads. Swelling clay potentially present in the bedrock would not present a hazard if left undisturbed.

4.3.2 Impacts to Geological and Mineral Resources from Alternative 1R, Applicant Proposed Alternative

4.3.2.1 Mineral Resources

Potential impacts to mineral resources from the Alternative 1R include:

- Limitation of access to resources resulting in loss of recovery of the resource. The loss in recovery would result in loss of revenue to royalty owners and loss of revenue in the form of fees and taxes to governmental entities including Carbon County, State of Wyoming, and the federal government.
- The demand for sand and gravel by the proposed project could create shortages in local supplies requiring new mineral materials disposals.

Potential impacts due to conflicts with oil and gas development are expected to be minor given the low potential for development of those resources in the Application Area. If oil and gas development were to occur, it would not necessarily be precluded by the proposed project as described below.

Access limitations could occur as a result of placement of wind turbines, power lines, and access roads such that they would interfere with the location and spacing of oil and gas wells. Potential access limitations would affect various oil and gas resources in different ways. Marginal conventional oil and natural gas wells or relatively shallow coal bed natural gas wells generally have to be vertical in order to

reduce development costs and maintain commercial viability. Limitations caused by project infrastructure could have adverse effects on these types of oil and gas resources. However, the Wyoming Oil and Gas Conservation Commission has oil and gas rules that would effectively deal with potential land use conflicts by allowing exception locations, providing the applicant can show cause and demonstrate that waste (non-recovery) of oil and gas would occur without an exception.

However, potential access limitations would be less for other kinds of unconventional oil and gas resources. For shale gas and oil extracted from low-permeability rocks (such as the Niobrara and Mowry Formations) horizontal drilling is the primary and most efficient method of extraction. Oil and gas operators would be able to drill horizontal laterals up to several thousand feet in length. Laterals of such lengths would allow for surface locations of such wells to be spotted such that the infrastructure of the proposed project would not impede access to the resource.

In Alternative 1R it is proposed to build or upgrade 335 miles of roads in order to accommodate construction activities. Based in **Table 2-2**, Alternative 1R would need 1,384,200 cys of aggregate material. This translates to approximately 2.2 million tons of aggregate (1.6 tons per cubic yard; Glover 2003). However, since PCW proposes to import the aggregate materials from distant sources by railroad (PCW 2010b), there would be no impacts on local sources of aggregate.

4.3.2.2 Geological Hazards

Potential impacts from geological hazards include:

- During construction, disturbance of landslide material causing instability resulting in slope failure and causing damage to project infrastructure;
- During operation, wind turbine towers built too close to the edge of landslide-formed escarpments so that erosion of slopes would result in loss of support and subsequent damage to project infrastructure; and
- During operation, areas underlain by Cretaceous shale that contains swelling clay or bentonite. Could undermine foundational support of wind turbine towers. Areas with bentonite layers that are subject to fluctuating shallow-water table would be especially at risk to impacts due to swelling soil.

Potential landslide effects would most likely occur at the Miller Hill escarpment where landslides have been documented. Approximately 6.7 acres of landslide deposits would be affected during construction and 1.4 acres in the long-term. Landslides have the potential to undermine tower foundations and roads and the effects could be severe.

The shrinking and swelling of bentonite layers in the bedrock could undermine tower foundations resulting in damage to concrete footings and ultimately loss of support. The formations most likely to contain bentonites are the Lewis Shale, Mowry Shale, and the Thermopolis Shale. In Alternative 1R, these formations comprise approximately 34 acres.

4.3.3 Impacts to Geological and Mineral Resources from Alternative 2, Checkerboard Only

4.3.3.1 Mineral Resources

Development on the Alternative 2 Checkerboard Only would result in potential impacts to mineral resources that would be similar to Alternative 1R, except that gravel resources required would be 17 percent greater than Alternative 1R.

4.3.3.2 Geological Hazards

Potential impacts due to landslides from Alternative 2 would be similar to Alternative 1R because the proposed development on Miller Hill is much the same and would occur in or adjacent to landslide areas. Approximately 5.6 acres of landslide deposits would be affected in the short-term and 1.1 acres in the long-term. In Alternative 2 there are approximately 123 acres of bentonite-prone bedrock.

4.3.4 Impacts to Geological and Mineral Resources from Alternative 3, No Miller Hill or Sierra Madre

4.3.4.1 Mineral Resources

Alternative 3 would not substantially reduce potential impacts to minerals with the elimination of Miller Hill and Sierra Madre portions of the project because the development would be shifted to eastern portions of the Chokecherry segment as compared to Alternative 1R. The gravel resources required would be 12 percent greater than Alternative 1R.

4.3.4.2 Geological Hazards

Alternative 3 would nearly eliminate potential impacts due to landslides, with less than 1 acre of short-term and long-term disturbance to landslides within the boundaries of the alternative **(Figure 3.3-4)**. In Alternative 3 there are approximately 124 acres of bentonite-prone bedrock.

4.3.5 Impacts to Geological and Mineral from Alternative 4, Private Lands Only

4.3.5.1 Mineral Resources

Development on the Alternative 4 would result in potential impacts to mineral resources that would be similar to Alternative 1R, except that gravel resources required would be 18 percent greater than Alternative 1R.

4.3.5.2 Geological Hazards

Potential impacts due to landslides from Alternative 4 would be similar to Alternative 1R. Approximately 4.8 acres of landslide deposits would be affected in the short-term and 1.0 acres in the long-term. In Alternative 4 there are approximately 180 acres of bentonite-prone bedrock.

4.3.6 Mitigation and Mitigation Effectiveness

4.3.6.1 Mineral Resources

No mitigation is proposed for resource conflicts associated with oil and gas exploration and development.

If there is a demand for sand and gravel resources, more gravel pits would have to be permitted. However, no specific mitigation is recommended.

4.3.6.2 Geological Hazards

<u>Landslides</u>

Where landslide hazards are present for each of the alternatives, tower, road, and transmission line locations in landslide deposits or close enough to be affected by active landslide areas should be reviewed for slope instability. If potential hazards are present, moving proposed facilities would be the best option unless moving a wind turbine would reduce its potential efficiency. If avoidance is not possible, then implementation of appropriate site-specific geotechnical design and landslide mitigation measures is recommended.

Swelling Soil

All of the alternatives contain some portion of area that is underlain by bedrock that potentially contains bentonite layers. It is recommended that appropriate geotechnical testing be conducted at each tower site to determine the risk for swelling soil. If swelling soil is present, standard engineering practice in construction of tower foundations to mitigate the risk should be implemented.

Avoidance of landslide areas would be highly effective in reducing the risk of slope instability hazards. Implementation of appropriate site-specific geotechnical design would also be highly effective in reducing risks associated with landslides and swelling soil hazards.

4.3.7 Residual Impacts

A very small risk of facility damage would remain after implementation of landslide avoidance and geotechnical design measures for slope instability and swelling soils.

4.3.8 Irreversible and Irretrievable Commitment of Resources

There are no irreversible and irretrievable commitments of resources concerning mineral or geological resources.

4.3.9 Relationship between Local Short-term Uses and Long-term Productivity

There are no long-term effects in regard to mineral productivity or area geology.

4.4 Impacts to Lands and Realty

This section describes potential impacts to land use and land management that may result from the proposed project. The land use impact analysis area is the Application Area, which is dominated by a checkerboard ownership pattern with alternating sections of public (BLM) and private lands, and some state-owned lands. Landownership within the Application Area is described in Section 3.4, Land Use.

In general, land use impacts would be minor and not significant. Potential impacts to current land use activities of wildlife, grazing, visual, recreation, and limited mineral leasing are described in other appropriate sections of Chapter 4.0. There is considerable overlap between potential land use impacts and other resource impacts; therefore, any potential impacts to these resources are discussed in their respective section only and are not repeated here. For example, potential impacts to grazing in the Application Area are discussed in Section 4.6, Impacts to Range.

Multiple land use-related issues were identified during the public scoping process. Most of the scoping issues that were categorized as land use also are related to other resource areas, including range, recreation, socioeconomics, and transportation, among others. As such, some of the scoping issues listed below also may be referenced in other appropriate sections of Chapter 4.0. In general, the land use-related issues identified during the scoping process can be categorized in several broad statements, including (BLM 2009c):

- The EIS should evaluate the effects of reduced access to public lands for recreation and potential limitations on extracting minerals from existing mineral leases.
- Concern about project impacts to the Wyoming Fish and Game easements along the North Platte River from road upgrades.
- Induced residential growth or change in land use due to proposed road network.

More specifically, public scoping participants expressed concern about the potential loss of hunting opportunities, loss of access to public and state lands, impacts of utility corridors on terrestrial resources and residential areas, and impacts to grazing and the livestock industry (primarily from increased traffic and decreased palatability of vegetation/forage from traffic-related dust). These specific land use-related scoping statements are addressed as follows:

- Potential impacts to grazing and the livestock industry are discussed in Section 4.6, Impacts to Range;
- Potential impacts to hunting opportunities, leases, and permits are discussed in Section 4.7, Impacts to Recreation;
- Potential impacts to access and roads are discussed in Section 4.10, Impacts to Transportation;
- Potential impacts to aesthetics and visual resources are discussed in Section 4.12, Impacts to Visual Resources; and
- Potential impacts to terrestrial resources are discussed in Section 4.14, Impacts to Wildlife and Fisheries Resources.

Federal regulations and planning documents, as well as Carbon County planning documents, provide legal and regulatory guidance related to land use and management within the Application Area. These include the Rawlins RMP, FLPMA, Minerals Leasing Act, and BLM CFRs 2800 and 2880. These plans and related management considerations are listed in **Table 4.4-1**.

Table 4.4-1 Relevant Management Considerations for Land Use

BLM Rawlins RMP and ROD – Lands and Realty[1] (Vol. 1, Chapter 2, page 2-26)
Management Goals • Manage the acquisition, disposal, withdrawal, and use of public lands to meet the needs of internal and external customers (i.e., to respond to community needs for expansion and economic development and to preserve important resource values). • Improve management efficiency in areas of scattered or intermingled landownership patterns. • Review and evaluate the need and merits of current withdrawals.
Management Objectives • Identify public lands within the Application Area available for acquisition, disposal, or withdrawal. • Develop and maintain a landownership pattern that will provide better access for management and protection of the public lands. • Respond to internal and external requests for land tenure adjustments (e.g., Recreation and Public Purpose Act actions, land sales, disposals, or exchanges). • Utilize appropriate actions (e.g., land tenure adjustments or easement acquisitions) to help solve problems related to intermixed landownership patterns. • Manage public lands to be consistent with goals and objectives of other resource programs. • Respond to internal and external requests (e.g., pipelines, access roads) for land authorizations.
Carbon County 2010 Comprehensive Land Use Plan (Chapter 8, page 89-90)
Management Goals • Achieve a sustainable balance between energy development, agriculture, and the environment.
Management Strategies • Enhance the County government's capacity to monitor, comment on, and influence state and federal decisions on energy development projects. • Develop standards for wind energy, transmission lines, and other alternative energy development so they can occur with limited environmental impact on traditional land uses, humans, and wildlife. • Support mitigation of impacts created by energy industries where available science supports mitigation.
Management Actions • Conduct regular meetings between the Board of County Commissioners, BLM, DEQ, USFS, and other governmental bodies to share information about pending energy projects. • Participate in comment periods for environmental impact statements. • Research best practices information for developing standards that encourage alternative energy development and transmission lines with the least environmental impact. • Prepare standards for adoption as part of the County Zoning Resolution. • Maintain dialog with energy industries by regular meetings to keep communication current. • Identify issues that need mitigation and develop solutions for resolution with industry leaders. • If available science indicates a proposed energy project cannot mitigate its impacts, Carbon County should either not approve the project or else recommend that it be located in a more suitable location.

Table 4.4-1 Relevant Management Considerations for Land Use

Carbon County Zoning Resolution (Chapter V, Section 5.2; page 47)
Regulations Applying To Certain Uses and Districts Wind Turbines • Placement of a private wind turbine requires application for a building permit. • Wind turbines must conform to the following minimum yard (or set back) requirements; the wind turbine must be located 1.5 times the total height of the tower, turbine, and blade (to the top of such blade when in vertical position) away from any adjacent buildings or overhead utility lines. • The bottom of the blade when in a vertical position must have at least 17 feet (17') of clearance from ground level.
FLPMA – Land Use Planning[2]
The BLM shall, "develop, maintain, and, when appropriate, revise land use plans which provide by tracts or areas for the use of the public lands. Land use plans shall be developed for the public lands regardless of whether such lands previously have been classified, withdrawn, set aside, or otherwise designated for one or more uses."
43 CFR. PART 2800 – ROWs under FLPMA and PART 2880 – ROWs under the Mineral Leasing Act[3]
It is BLMs objective to grant ROWs under the regulations in this part to any qualified individual, business, or government entity and to direct and control the use of ROWs on public lands in a manner that: (a) Protects the natural resources associated with public lands and adjacent lands, whether private or administered by a government entity; (b) Prevents unnecessary or undue degradation to public lands; (c) Promotes the use of ROWs in common considering engineering and technological compatibility, national security, and land use plans; and (d) Coordinates, to the fullest extent possible, all BLM actions under the regulations in this part with state and local governments, interested individuals, and appropriate quasi-public entities.

[1] BLM 2008a.

[2] BLM 2001.

[3] National Archives and Records Administration 2009.

The general method for identifying potential land use and management impacts within the Application Area included reviewing existing data sources, quantifying the extent to which the project would impact land use acreages, identifying conflicts with applicable land use plans and/or regulations, and identifying the lost opportunity for land tenure adjustments. Significance criteria were developed using these general methods as a guideline, as well as from issues identified through internal and public scoping. Potential land use impacts resulting from each of the alternatives were identified using this general methodology. Potential impacts were considered significant if they met one of the following significance criteria:

- Substantial conflict with existing land uses, including current land use authorizations;
- Substantial change in land use designations;
- Substantial reduction in opportunity for ROW authorizations and development activities; and
- Substantial reduction in the opportunity for land tenure adjustments.

Finally, the land use impact analysis was conducted using the following assumptions:

- The project would not limit existing access to public lands. Public access is already limited due to public-private checkerboard land ownership pattern.
- Grazing is the primary land use in the Application Area (ranch lands), and recreation, visual resources, and wildlife habitat are important land use values. However, impacts to these resources are fully described in their respective section and referred to in this section.

4.4.1 Impacts to Lands and Realty from the No Action Alternative

Under the No Action Alternative, there would be no anticipated impacts to lands and realty as the proposed project would not be developed. Under this alternative, the BLM would prohibit development on public lands, as well as access to private lands for the wind energy project either through denial of permits or decisions by proponent not to construct. Furthermore, the State of Wyoming would restrict development on private and state lands in the Application Area. The combined result of these restrictions would be to prohibit the development of the project in the Application Area.

4.4.2 Impacts to Land Use from Alternative 1R, Applicant Proposed Alternative

4.4.2.1 Land Ownership and Use

Land Ownership

Under the Alternative 1R, 1,000 WTGs and associated facilities (e.g., transmission lines, roads, etc.) would be developed throughout the Alternative 1R Application Area (**Figure 2-3**) on both public and private lands. The proposed project would be almost entirely located within the existing boundary of TOTCO. As shown in **Table 4.4-2**, approximately 1.0 percent of the Alternative 1R Application Area is located outside of TOTCO boundary, including state lands and public land within a small portion of the Upper Muddy Creek/Grizzly WHMA. **Table 2-1** summarizes how the project would utilize public, state, or private lands. In all cases, the proposed project is not anticipated to affect the current ownership or land uses in these sections.

Over the long term operations and maintenance phase, the proposed project would occupy 1,544 acres on less than 1 percent of the Alternative 1R area. Operations and maintenance would not impact current land designations or ownership (including private residences and in-holdings), except in one location shown in **Table 4.4-2**. There would be no significant effect to land designations or ownership from potential development on public, state owned and private land. As such, significant changes in land ownership are not anticipated.

Land Use

Current land use authorizations for existing land uses consist of ROWs, easements, and leases for grazing, utilities, and oil and gas production. Construction activities would disturb 7,221 acres of the Alternative 1R Application Area over the 9-year construction and reclamation period. Ground disturbance from construction activities is estimated to be a very small percentage (3.3 percent) of the Alternative 1R area of 215,560 acres. Construction activities would take place concurrently in different locations within the Application Area. Road construction would occur across the entire Alternative Area in year 1, and would be concentrated in specific development areas during years 2-4.

Table 4.4-2 Effects to Land Uses on Non-TOTCO and Non-BLM Lands[1]

Area	Total Acres Outside of TOTCO[2]	Percent of Area Outside of TOTCO	Location	Facilities
Application Area	9,572	4	–	–
No Action	0	0	–	–
Alternative 1R	2,218	1	State lands in T18N R87W Section 36, and T18N R86W Section 36.	Potential WTGs, access roads, and electrical collection lines as shown in the conceptual area of development for Alternative 1R (**Figure 2-3**). Proposed project components would be developed in one section (T18N R88W Section 9) of TOTCO that includes parcels currently owned by another private entity including residences. WTGs would not be constructed in buffers placed around residences in Section 9, in accordance with HB0072. The proposed project is not anticipated to affect the current ownership in this section.
Alternative 2	1,143	1	On or adjacent to small portions of privately owned lands in T20N R88W Section 13, T18N R88W Section 9, and T20N R87W Section 4.	While most project components would be sited on BLM-managed and TOTCO owned lands, several WTGs and/or project roads are proposed on or adjacent to private in-holdings within TOTCO boundary as shown in the conceptual area of development for Alternative 2 (**Figure 2-4**). Specifically, a project road would be sited within T20N R88W Section 13, and both WTGs and project roads would be sited within T18N R88W Section 9 and T20N R87W Section 4. Small portions of Section 9 are privately owned, and include residences. WTGs would not be constructed in buffers placed around residences in Section 9. A small in-holding in Section 4 includes a gravel quarry. WTGs would not affect the operation of the gravel pit.
Alternative 3	1,143	1	State lands in T18N R86W Section 36. On or adjacent to small portions of privately owned lands in T20N R88W Section 13 and in T20N R87W Section 4.	WTGs would potentially be developed on state lands in T18N R86W Section 36. WTGs and/or project roads also are proposed in or adjacent to private in-holdings within TOTCO as shown in the conceptual area of development for Alternative 3 (**Figure 2-5**). Specifically, a project road would be sited within T20N R88W Section 13, and WTGs (3) would be sited within T20N R87W Section 4. Union Pacific owns Section 13. A small inholding in Section 4 includes a gravel quarry, which would not be affected by WTGs located nearby.

Table 4.4-2 Effects to Land Uses on Non-TOTCO and Non-BLM Lands[1]

Area	Total Acres Outside of TOTCO[2]	Percent of Area Outside of TOTCO	Location	Facilities
Alternative 4	2,232	1	T17N R88W Sections 24 and 2, T18N R86W Section 36, T18N R88W Section 9, T20N R88W Section 13, and T20N R87W Section 4.	A potential access road on T18N R86W Section 36. WTGs and/or project roads are proposed on or adjacent to several private in-holdings within the TOTCO boundary. Specifically, a project road would be sited within T20N R88W Section 13 and T20N R87W, and both WTGs and project roads would be sited within T18N R88W Section 9 and T17N R88W Sections 24 and 25. Small portions of Section 9 are privately owned and include residences. WTGs would not be constructed in buffers placed around the residences. All of Section 25 and most of Section 24 are exclusion areas because they are within a greater sage-grouse core breeding area.

[1] WTGs located on lands outside TOTCO would be located on state lands.

[2] Includes all public and private land outside of the TOTCO boundary.

The construction of the proposed project may displace grazing and recreation uses and other existing land uses in the Alternative 1R area, as evaluated in the appropriate resource sections of the document. These impacts would generally be short term and include ground disturbances, road and access closures, increased traffic, grazing area closures, and air quality, noise, recreation, and visual disturbances at private residences and in-holdings, but would not likely result in significant long-term changes in land use or any land use designations in the Alternative 1R area. Impacts to residential land uses from construction-related changes in air quality, noise, and visual disturbances are evaluated in the appropriate resource section. There would be no significant effect to the management of existing land uses through land use authorizations.

In the long term, the proposed project would be located on less than 1 percent of the Alternative 1R area, and its operation would not directly impact current land uses. There is currently very limited oil production and other mineral development within the Application Area. There would be no significant effect to oil production from the one producing well located in T19 North Range 87W, Section 12, as the well would be easily avoided during the siting of individual WTGs and associated infrastructure.

Proposed project components would be developed in only one section (T18N R88W Section 9) of TOTCO that includes residences. WTGS would not be constructed in buffers placed around residences in Section 9, in accordance with HB0072; however, impacts to residential land uses from the operation of the project would consist of noise and visual intrusions, and are evaluated in the appropriate resource sections.

The proposed project would use the existing road network to access conceptual development areas. New access roads would be constructed from the existing main roads to individual WTG sites in the conceptual areas. There would be no induced residential growth from new access roads, because these roads provide access primarily within the checkerboard land ownership area. Similarly, land uses would not change from the development of new access roads.

Localized land use impacts are not anticipated from the placement of WTGs, utility corridors, and other project facilities.

The effects to land uses and access from the decommissioning of the project under Alternative 1R would be very similar to the impacts that would occur from construction activities. Upon decommissioning, land use impacts from construction and operation of the project would generally be reversible with successful reclamation, and thus, no permanent land use impacts would be anticipated from the project in the Alternative 1R area.

Construction, operation and decommissioning of the proposed project under Alternative 1R is not expected to affect land uses, public land use designations, and current land use authorizations for these land uses. Wind power development is consistent with BLM Rawlins management direction for public lands (BLM 2008a), as well as Secretarial Order 3283(DOI 2009).

4.4.2.2 Land Ownership Adjustment

Land tenure adjustments include land sales, disposals, or exchanges, in addition to ROW management, which is addressed in Section 4.4.2.4, and may be used to help solve problems related to intermixed landownership patterns. Potential problems in the checkerboard include the management of resources and the mitigation of impacts to resources that affect intermingled public, private and state-owned lands. Minimizing or avoiding impacts as provided for in the BLM resource management objectives and BLM standard mitigation are not required for adjacent private lands in the checkerboard land ownership area. In addition, impacts to resources from proposed facilities and activities located on private and state lands also would affect resources and land uses on adjacent public lands. Implementing mitigation and monitoring strategies on public lands would be complicated by the inability of the BLM to provide similar management of resources on adjacent private lands. However, TOTCO currently owns 97 percent of

private lands in the Application Area, and is an affiliate of PCW. All ACMs and BMPs proposed in the proponent's POD (summarized in Chapter 2.0 of this EIS) would be implemented on public and TOTCO-owned private land in the Applications Area. ACMs and BMPs provided for resource impacts in the POD are compatible with BLM management objectives, and are summarized in the appropriate resource section of this EIS. Additional land owner adjustments would not be required in the Application Area to solve project-related impacts that occur in the checkerboard land ownership area. It is not anticipated that the proposed project in the Application Area would affect any land tenure adjustments that may be required for other management actions.

No proposed facilities would be constructed or operated on identified BLM disposal lands, as all lands being considered for disposal within the Application Area are located outside of the Alternative 1R Chokecherry and Sierra Madre sites. There would be no impact to identified land ownership adjustments from the construction, operation, and decommissioning of Alternative 1R.

4.4.2.3 Withdrawals/Classifications

Current withdrawals in the Application Area include the Teton Reservoir Recreation Site. The reservoir is located outside of the Chokecherry and Sierra Madre sites. No facilities proposed for Alternative 1R would be located within the recreation site withdrawal area.

4.4.2.4 ROWs and Leases

As stated in the introduction to this section, the land use impact analysis was conducted using the assumption that the proposed Project would not change the existing limited public access to public lands, which is limited due to public-private checkerboard land ownership pattern. Potential impacts to land tenure involve conflicts with ROWs or easements, which are located throughout the Application Area.

Access to public lands would temporarily be restricted in construction areas; however, once the construction phase is completed, access consistent with current restrictions would be restored to public lands. Public roads would remain open; however, traffic may experience temporary delays. These impacts are not expected to be significant and would only affect a small portion of the Alternative 1R area.

Over the long-term, the linear infrastructure associated with WTG development under Alternative 1R would be collocated within the disturbance of a new road network, and take advantage of existing road ROWs to the extent practicable. Construction and operation of the proposed project would be compatible with existing ROWs, as linear ROWs would generally provide opportunities to co-locate linear project facilities with existing roads and utilities, thereby reducing impacts to other resources. Areas designated as avoidance areas for ROWs would not be affected by proposed project construction and operation.

The public's current ability to access public lands in the Application Area would not be impacted under Alternative 1R, except during construction and decommissioning for safety and security reasons. Temporary fencing would be installed around staging areas, storage yards, and excavations during construction. Permanent fencing would be installed and maintained around electrical substations. Turbine tower access doors would be locked to prohibit public access.

An oil and gas lease located in T19 North Range 87W Section 12 (Chokecherry site) contains one well that was productive in 2010. The well site would easily be avoided during the construction of the proposed facilities in the section. The proposed project would not adversely affect the ability of the operator to continue the current use of the lease. Existing oil and gas leases have a right of reasonable access, so that there would be no limitation or restriction to future access to mineral resources.

In the event that the siting of individual WTGs or other project components would conflict with current land tenure activities, additional access would be secured through site and route analyses. There would be no adverse impact to existing utilities and roads, or conflicts with the terms of existing ROWs and leases for these facilities from the construction, operation, and decommissioning of the proposed project. It is not anticipated that the using existing ROWs for the location of proposed linear infrastructure would change public access and land tenure in the Application Area. There would be no adverse impact to existing utilities and roads, or conflicts with the terms of existing ROWs and leases for these facilities from the construction, operation, and decommissioning of the proposed project.

4.4.2.5 Transportation and Utility ROW Corridors

The alternative location for the O&M building and a portion of the proposed access road to the building would be within the I-80 Corridor within a 40-acre site located in T21N R86W, Section 25. The location is next to existing water and electric lines. Effects to existing uses of the corridor would consist of temporary disruptions from construction and decommissioning activities. There would be no disruptions of existing uses of water and electric lines in the corridor from the operation of Alternative 1R. No other proposed project facilities would be located within the I-80 and Rock Springs to Dave Johnson corridors.

A portion of the designated 368 energy corridor crosses through the Application Area in T21 North Range 87W; Sections 32, 34, and 26, and T21N and R84W, Sections 22 and 26. None of the designated corridor ROW is within the Chokecherry site.

The existing I-80 Corridor, the Rock Springs to Dave Johnson Corridor, and the designated Section 368 energy corridor provide an adequate area and a de facto corridor for the placement and development of future ROWs, and are expected to satisfy future needs for energy transmission (BLM 2008a). There would be no conflict with existing and potential uses of these existing designated corridors from the construction, operation, and decommissioning of Alternative 1R.

4.4.2.6 Wind Energy Exclusion and Avoidance Areas

In accordance with the Rawlins ROD, Wind Energy Avoidance Area may be available for location of ROWs with special stipulations or mitigation measures. WTG's and ancillary facilities would not be sited in the Wind Energy Exclusion and Avoidance Areas of the North Platte River SRMA, CDNST, Historic Trails Management Area, and existing and new recreation sites (avoidance area). WTG's and ancillary facilities would be sited in the Upper Muddy Creek/Grizzly WHMA. The sensitive resource values that are the basis for the avoidance area designation for the WHMA are the Colorado River fish species unique to the Muddy Creek watershed, and crucial winter habitat for elk and mule deer. These areas are addressed in Section 3.15, Special Status Species, and potential adverse effects and mitigation for these resources is further addressed in Section 4.15, Impacts to Special Status Species.

4.4.2.7 BLM Special Management Areas

As required to meet management goals stated in the Rawlins ROD for historic trails, no facilities are proposed within 0.25 mile of the Overland Historic Trail and the North Platte River. The applicant has committed to a 1-mile setback except in specific locations as discussed in **Appendix C**.

Potential adverse effects to other special management areas from construction, operation, and decommissioning activities under Alternative 1R include effects to visual resources, recreation activities, and wildlife. These effects are addressed in the appropriate resource sections of the document.

4.4.2.8 Lands with Wilderness Characteristics

Development of Alternative 1R would intersect with two inventory units determined to meet LWC criteria: Sage Creek Basin West and Sage Creek Basin East. In the Sage Creek Basin West unit, up to 5 acres of initial disturbance resulting in 1 acre of long-term disturbance would occur in the northeastern portion

of the unit. Disturbance would be associated with development of access roads and WTGs on public and private lands. The remaining 6,712 acres of the unit not disturbed by the project would continue to meet the criteria for LWC. In the Sage Creek Basin East unit, up to 214 acres of initial disturbance resulting in 41 acres of long-term disturbance would occur in the northern portion of the unit. The remaining 10,505 acres of the unit not disturbed by the project would continue to meet the criteria for LWC.

4.4.2.9 State and Local Planning and Zoning

The Carbon County Comprehensive Land Use Plan and Zoning Regulations govern land uses on private lands in the Application Area (Carbon County 2010). Wind power development is consistent with the Land Use Plan objectives for future land uses in the Application Area, which identifies the development of wind power in the Application Area through a future land use overlay. The Application Area is currently within a Ranching, Agriculture, Mining Zone, requiring a Conditional Use authorization from the county to develop the proposed project. There would be no significant effect to land use designations and no change in the zoning designation of private lands from the proposed project. Construction, operation and decommissioning of the proposed project under Alternative 1R would not conflict with future land use categories and the current zoning designation for private land in the Application Area.

4.4.3 Impacts to Land Use from Alternative 2, Checkerboard Only

Under Alternative 2, 1,000 WTGs and associated facilities would be developed throughout the checkerboard portion of the Alternative 2 area (**Figure 2-4**) on both public and private lands. Unlike Alternative 1R, no WTGs or associated facilities would be sited south of T18N.

Construction activities would disturb 8,795 acres (4.8 percent) of the 182,233-acre Alternative 2 Application Area over the four year construction period. There would be no significant changes in landownership from construction activities in the Alternative 2 area.

Over the long-term operations and maintenance phase, the proposed project would occupy 1,842 acres on approximately 1 percent of the Alternative 2 area. Alternative 2 would disturb 19 percent more area than Alternative 1R. As shown in **Table 4.4-2**, less than 1 percent of the Alternative 2 Application Area is located outside of TOTCO. The proposed project is not anticipated to affect the current ownership or land uses in these sections.

Alternative 2 impacts to existing land use authorizations, BLM and Carbon County land use designations, the opportunity for ROW authorizations and development activities, and the opportunity for land tenure adjustments are the same as described for Alternative 1R.

There would be no significant impacts to existing land use and management activities from the construction, operation, and decommissioning impacts.

Development of Alternative 2 would intersect with one inventory unit determined to meet LWC criteria: Sage Creek Basin East. Up to 46 acres of initial disturbance resulting in 10 acres of long-term disturbance in the northern portion of the Sage Creek Basin East unit would occur. Disturbance would be associated with development of access roads and WTGs on public and private lands. The remaining 10,673 acres of the unit not disturbed by the project would continue to meet the criteria for LWC. Development under this alternative would not affect the Sage Creek Basin West unit.

4.4.4 Impacts to Land Use from Alternative 3, No Miller Hill or Sierra Madre

Under Alternative 3, 1,000 WTGs and associated facilities (e.g., transmission lines, roads) also would be developed in the alternative area (**Figure 2-5**), on both public and private land, though their placement would be restricted to a smaller Application Area compared to Alternative 1R. The 1,000 WTGs and associated facilities would be concentrated in the Chokecherry portion of the Alternative 3 area, as well

as the eastern (east of T18N R88W) section of the Sierra Madre (Sage Creek Basin) portion. None of the proposed project would be sited within the western portion of the Sierra Madre and the Miller Hill areas (public lands in these areas are primarily classified as wind avoidance areas in the Rawlins RMP) to help avoid effects to visual resources and the Upper Muddy Creek/Grizzly WHMA.

Construction activities would disturb 8,504 acres (5.5 percent) of the 155,883-acre Alternative 3 Application Area over the four year construction period. There would be no significant changes in landownership from construction activities in the Alternative 3 area.

Over the long term operations and maintenance phase, the proposed project would occupy 1,780 acres on slightly more than 1 percent of the Alternative 3 area. Alternative 3 would disturb 15 percent more area than Alternative 1R.

As shown in **Table 4.3-2**, less than 1.0 percent of the Alternative 3 Application Area is located outside of TOTCO. There is a potential that a small number of WTGs also would be located outside of TOTCO as described for Alternative 1R, and shown in the conceptual area of development for Alternative 3 (**Figure 2-5**). The proposed project is not anticipated to affect the current ownership or land uses in these sections.

Alternative 3 impacts to existing land use authorizations, BLM and Carbon County land use designations, the opportunity for ROW authorizations and development activities, and the opportunity for land tenure adjustments are the same as described for Alternative 1R.

There would be no significant impacts to existing land use and management activities from the construction, operation, and decommissioning impacts.

Development of Alternative 3 would intersect with one inventory unit determined to meet LWC criteria: Sage Creek Basin East. Up to 49 acres of initial disturbance resulting in 10 acres of long-term disturbance in the northern portion of the Sage Creek Basin East unit would occur. Disturbance would be associated with development of access roads and WTGs on public and private lands. The remaining 10,670 acres of the unit not disturbed by the project would continue to meet the criteria for LWC. Development under this alternative would not affect the Sage Creek Basin West unit.

4.4.5 Impacts to Land Use from Alternative 4, Private Lands Only

In general, the anticipated land use impacts (e.g., changes to land uses, designations, and/or ownership) under Alternative 4 would be similar to those previously described in both Alternative 1R. However, the impact (i.e., development of the project) to BLM-managed lands within the alternative area would be considerably less, since all 846 WTGs would be sited on private lands only. Access roads and transmission lines would still be located on public lands. The checkerboard land ownership would present challenges similar to those described for Alternative 1R, as access roads and collector lines would be located on public and private lands. Effects to resources from the project on private lands could affect resources on adjacent public lands.

Construction activities would disturb 8,918 acres (4.1 percent) of the 215,729-acre Alternative 4 Application Area over the four year construction period. There would be no significant changes in landownership from construction activities in the Alternative 4 area.

Over the long term operations and maintenance phase, the proposed project would occupy 1,871 acres on slightly less than 1 percent of the Alternative 4 area. Alternative 4 would disturb 21 percent more area than Alternative 1R.

As shown in **Table 4.4-2**, approximately 1.0 percent of the Alternative 4 Application Area is located outside of TOTCO. As displayed on the conceptual area of development for Alternative 4 (**Figure 2-6**),

the 846 WTGs and associated facilities would be concentrated on private lands only within the alternative project boundary, including both the CCSM areas. The proposed project is not anticipated to affect the current ownership or land uses in these sections.

Alternative 4 impacts to existing land use authorizations, BLM and Carbon County land use designations, the opportunity for ROW authorizations and development activities, and the opportunity for land tenure adjustments are the same as described for Alternative 1R.

There would be no significant impacts to existing land use and management activities from the construction, operation, and decommissioning impacts.

Development of Alternative 4 would intersect with one inventory unit determined to meet LWC criteria: Sage Creek Basin East. Up to 32 acres of initial disturbance resulting in 6 acres of long-term disturbance in the northern portion of the Sage Creek Basin East unit would occur. Under this alternative, disturbance would primarily be associated with access roads to develop WTGs on private lands. The remaining 10,687 acres of the unit not disturbed by the project would continue to meet the criteria for LWC. Development under this alternative would not affect the Sage Creek Basin West unit.

4.4.6 Mitigation and Mitigation Effectiveness

All action alternatives would incorporate applicant committed measures and BMPs described in Chapter 2.0 and found in **Appendix C**.

GEN-1: Phased Construction Sequence Mitigation (Chapter 2.2 and **Appendix A**, Section A.1.3.1) would change all action alternatives by issuing four ROW grants for the project, sequenced to limit surface disturbance to areas where WTGs would be constructed within 12 months with a goal to mitigate impacts from surface disturbance.

Effectiveness: GEN-1 would reduce the duration of short-term grazing conflicts by compressing the time between construction and reclamation, and increasing the effectiveness of reclamation.

Since land use impacts from all action alternatives are anticipated to be minor, no other mitigation measures are needed at this time for land use impacts.

4.4.7 Residual Impacts

No significant impacts were identified for land ownership and use, tenure adjustments, withdrawals/classifications, ROWs and leases, ROW corridors, and state and local planning and zoning; therefore there are no residual impacts from the proposed project under any action alternative. Grazing and recreation uses may be displaced during the construction and reclamation period. Recreation, visual, and wildlife impacts occur in special management areas, as evaluated in the appropriate resource sections.

4.4.8 Irreversible and Irretrievable Commitment of Resources

While development of the proposed project would result in an irretrievable commitment of land use in specific locations, these areas would be reclaimed upon decommissioning of the project so the commitment of resources is reversible. Further, operation of the project is generally compatible with other existing productive land uses (e.g., grazing, mineral extraction). As such, irretrievable commitments associated with land use in the Application Area are not significant. There would be no irreversible commitments of land use resources.

4.4.9 Relationship between Local Short-term Uses and Long-term Productivity

There are no land use-related short-term uses that would significantly affect the long-term productivity of land uses in the Application Area.

4.5 Impacts to Paleontological Resources

The methodology used in assessing potential impacts to paleontological resources involved the identification of the potential for paleontological resources in the Application Area based on the PFYC system and assessed the need for project specific protective measures. Relevant management considerations are shown in **Table 4.5-1**.

Table 4.5-1 Relevant Management Considerations for Paleontological Resources

BLM RMP and ROD – Paleontological Resources
Management Objectives • Maintain the integrity of the scientific value of paleontological resources. • Reduce imminent threats from natural or human-caused deterioration, or potential conflict with other resource uses. • Promote stewardship, conservation, and appreciation of paleontological resources.
Management Goals • Identify paleontological resources by defining priority inventory areas based on probability of occurrence of high-value resources. • Assess the need for project or site-specific treatment plans or other protective measures in areas of high risk for development or at high risk for adverse effects. • Develop, maintain, and encourage opportunities for scientific research of paleontological resources. • Provide educational opportunities and public outreach programs. • Develop and maintain interpretation of paleontological resources in areas of high public interest and access.
Management Actions • Paleontological resources will be managed to protect their important scientific values. Area closures, restrictions, or other mitigation requirements for the protection of paleontological values will be determined on a case-by-case basis. • Collecting of scientifically significant vertebrate fossils by qualified paleontologists is allowed by permit only. • Manage paleontological resources to meet the Wyoming Standards for Healthy Rangelands. • Develop interpretive facilities (such as signs, kiosks, and developed areas) at specific localities with high paleontological values on a case-by-case basis. • Collection of fossils from public lands is allowed with some restrictions, depending on the significance of the fossils. Hobby collection of common invertebrate or plant fossils by the public is allowed in reasonable quantities using hand tools. • Utilize on-the-ground survey prior to approval of surface disturbing activities or land disposal actions for Class 4 and Class 5 formations to avoid resource-bearing strata on a case-by-case basis. Monitor during surface disturbing activities in potential resource bearing strata on a case-by-case basis. Survey and monitor on a case-by-case basis following discovery for Class 3 formations.

Source: ROD, RMP Final EIS for the RFO p. 2-24. BLM 2008a.

Impacts to paleontological resources would be considered significant if destruction or loss of scientifically important fossils occurred either through direct actions of the proposed project or indirect effects of increased access resulting in the theft or destruction of fossil resources.

Assumptions used in the analysis include the following:

- Bedrock formations are present in all the alternatives that have the potential to contain high value paleontological resources.
- The analysis considers high- to medium-potential formations.
- High-potential formations considered in this analysis include Cloverly-Morrison-Sundance combined unit and Niobrara Formation (PFYC rank 5) (**Table 3.5-2**).
- Medium potential formations considered in this analysis include the Lewis Shale, Mesaverde Group, Steele Shale, Frontier Formation, Mowry Shale, Thermopolis Shale, and Chugwater Formation (PFYC rank 3) (**Table 3.5-2**).
- Documented fossil sites are located within proposed project development areas.

Table 2.6-1 summarizes and compares the potential impacts of the alternatives.

4.5.1 Impacts to Paleontological Resources from the No Action Alternative

Current management of the area would continue as directed by the Rawlins RMP EIS/ROD (BLM 2008). None of the proposed activities would occur under the No Action Alternative. Therefore, adverse impacts to paleontological resources may occur as the result of ongoing geological processes and disturbance through unauthorized collecting at currently accessible outcrops. The discovery and/or loss of potential fossil resources through the implementation of the proposed project would not occur.

4.5.2 Impacts to Paleontological Resources from Alternative 1R, Applicant Proposed Alternative

Potential impacts to fossil resources during construction of the proposed project would be both direct and indirect. Direct impacts include the destruction or loss of scientifically important fossil resources as a result of construction activities. In Alternative 1R, approximately 6,294 acres of formations with medium to high (PFYC Classes 3-5) potential for important fossil resources would be at risk for direct impacts. Indirect impacts during construction and operation would involve damage or loss of fossil resources due to the unauthorized collection of scientifically important fossils by construction workers or the public due to increased access to fossil localities near construction areas. Beyond the area of direct impacts is an indeterminate area adjacent to construction activities where formations with medium to high potential are at risk to indirect impacts. Adverse impacts to important fossil resources would be long-term and severe since fossils removed or destroyed are lost to science. It is possible that the proposed project would have the beneficial impact that ground disturbance activities might result in the discovery of important fossil resources. It is not anticipated that operation of the facility would have impacts to paleontological resources unless maintenance activities were to occur outside of previously disturbed areas.

4.5.3 Impacts to Paleontological Resources from Alternative 2, Checkerboard Only

In Alternative 2, approximately 7,543 acres of formations with medium to high potential for important fossil resources would be at risk for direct impacts. An indeterminate area close to construction having formations with medium to high potential is at risk to indirect impacts.

4.5.4 Impacts to Paleontological Resource from Alternative 3, No Miller Hill or Sierra Madre

In Alternative 3, approximately 7,874 acres of formations with medium to high potential for important fossil resources would be at risk for direct impacts. An indeterminate area close to construction having formations with medium to high potential is at risk to indirect impacts.

4.5.5 Impacts to Paleontological Resources from Alternative 4, Private Lands Only

In Alternative 4, approximately 7,625 acres of formations with medium to high potential for important fossil resources would be at risk for direct impacts. An indeterminate area close to construction having formations with medium to high potential is at risk to indirect impacts. Impacts for Alternative 4 would be similar to Alternative 1R; however, since the development would primarily take place on private lands, federal management of the resource would only take place where facility construction would have to cross public land. The at-risk potential resource for direct and indirect impacts would be similar to Alternative 1R.

4.5.6 Mitigation and Mitigation Effectiveness

The Rawlins RMP specifies certain management actions be taken with regard to paleontological resources and those actions of relevance to this project include the following:

- “Paleontological resources will be managed to protect their important scientific values. Area closures, restrictions, or other mitigation requirements for the protection of paleontological values will be determined on a case-by-case basis.”
- “Collecting of scientifically significant vertebrate fossils by qualified paleontologists is allowed by permit only.”
- “Utilize on-the-ground survey prior to approval of surface disturbing activities or land disposal actions for Class 4 and Class 5 formations to avoid resource-bearing strata on a case-by-case basis. Monitor during surface disturbing activities in potential resource bearing strata on a case-by-case basis. Survey and monitor on a case-by-case basis following discovery for Class 3 formations.”

In addition to the aforementioned management actions that apply to ground disturbing activities in the RFO, the following specific mitigation measures would be applied to this project to reduce the impacts to paleontological resources:

PALEO-1: If any vertebrate fossils or scientifically important fossils are discovered during construction operations, the permittee shall cease activities immediately and notify the BLM so the agency can determine the significance of the discovery. The BLM shall evaluate or have evaluated such discoveries and shall notify the permittee what action shall be taken with respect to such discoveries.

PALEO-2: Any fossils recovered during the assessment of paleontological resources will be prepared in accordance with standard professional paleontological techniques. The fossils will be curated in a BLM-approved facility. A report on the findings and significance of the salvage program, including a list of the recovered fossils, will be prepared following completion of the program. A copy of this report will accompany the fossils, and a copy will be submitted to the Wyoming Museum, University of Wyoming.

Effectiveness: The mitigation measures described above would be effective in reducing the potential impacts to paleontological resources.

4.5.7 Residual Impacts

Even if construction monitoring is implemented, some scientifically valuable fossils may be disturbed and lost during excavation and grading over the large number of miles of roads that are expected to be built. As a consequence, there would be a small incremental loss of fossil material that would be offset by the material that is recovered and preserved for scientific study purposes.

4.5.8 Irreversible and Irretrievable Commitment of Resources

The destruction or loss of scientifically important fossils would be an irreversible and irretrievable commitment of resources.

4.5.9 Relationship between Local Short-term Uses and Long-term Productivity

Issues concerning the relationship between local short-term uses and long-term productivity are not relevant to paleontological resources.

4.6 Impacts to Range

The range resource within the Application Area is managed with the goal to maintain or enhance livestock grazing opportunities and rangeland health. This overall range goal conflicts with the proposed project objective of developing the affected rangelands as sites for installation of wind generation facilities.

Impacts to range resources from the proposed project could result from physical surface disturbance and human activities associated with each of the alternatives. These impacts may be linked to soil and vegetation loss during construction activities, effectiveness of reclamation activities, weed control, dust control from roads and other barren surfaces, vehicle collisions with livestock, damage to fences and other range improvements, and increased access for recreational use by the public. These types of impacts may result in reduced forage availability (loss of AUMs), direct mortality to livestock, or increased costs and difficulty for managing livestock on the affected allotments. The primary concerns among these various potential impacts were voiced during the public scoping process as the issues listed below:

- Loss of palatable forage and the effects on livestock in terms of available AUMs of forage;
- Loss of palatable forage as a result of fugitive dust emissions from road use during construction and operation;
- Increased grazing pressures within riparian areas and available water sources as a result of loss or reduction of palatable forage;
- Potential conflict between livestock on the subject allotments and the increased volume of project related traffic in the area during construction and operation; and
- Potential conflict between grazing permittees, agricultural producers, and landowners both within and near the Application Area.

The BLM's management goal, objectives, and actions for managing rangelands for livestock grazing to address these issues are listed in **Table 4.6-1** (BLM 2008a).

Table 4.6-1 Relevant Management Considerations for Range

BLM RMP and ROD – Livestock Grazing
Management Goal • Maintain and/or enhance livestock grazing opportunities and rangeland health.
Management Objectives • Maintain, restore, and enhance livestock grazing to meet Wyoming Standards for Healthy Rangelands (BLM 2008a – Appendix 8) and achieve allotment objectives. • Encourage grazing permittees and the interested public to participate with the BLM to monitor and evaluate rangeland health to determine appropriate management actions. • Utilize livestock grazing management techniques (BLM 2008a – Appendix 19) to maintain vegetation communities and ecosystem functions, in consultation and coordination with the grazing permittees and with participation by the interested public. Utilize data collected from scientifically based inventory and monitoring techniques to support decisions that authorize livestock grazing levels and management. • When feasible and, providing that Wyoming Standards for Healthy Rangelands are met, maintain and/or increase AUM levels in the Application Area for livestock grazing.

Table 4.6-1 Relevant Management Considerations for Range

BLM RMP and ROD – Livestock Grazing
• Identify opportunities and implement range and vegetation improvement projects to sustain and enhance livestock grazing and meet Wyoming Standards for Healthy Rangelands in cooperation, consultation, and coordination with the grazing permittees and the interested public (BLM 2008a – Appendix 19). • Mitigate direct, indirect, and cumulative livestock forage losses and impacts to livestock grazing (including impacts on livestock grazing operational capabilities and production performance) where opportunities exist.
Management Actions (those relevant to the Application Area) • The entire Application Area is available for livestock grazing. Areas such as developed recreation areas, wetland/riparian spring exclosures, and sensitive plant species exclosures will be excluded from grazing. • The current amounts, kinds, and seasons of livestock grazing use will be authorized until monitoring, field observations, ecological site inventory, or other data acceptable to the BLM indicates a grazing use adjustment is needed, as appropriate. Requests for changes in season-of-use or kind-of-livestock will be considered on a case-by-case basis. Any decision regarding changes in grazing use will include cooperation, consultation, and coordination with the grazing permittees and the interested public. • Manage livestock grazing to meet the Wyoming Standards for Healthy Rangelands. • The BLM will work closely with operators and others to determine the most appropriate methods for achieving the desired plant community, in addition to meeting the Standards for Healthy Rangelands (BLM 2008a – Appendices 8 and 19). • Grazing systems and range improvements will be designed to achieve the management goals for livestock grazing and to achieve and maintain healthy rangelands.

Source: BLM 2008a – Chapter 2, Section 2.3.6, pp 2-18 through 2-19.

Impacts to rangeland health and livestock grazing would be considered potentially significant under the following situations:

- Project development and operational activities cause a reduction in forage availability (i.e., surface disturbance or access constraints) that results in greater than 10 percent permanent reduction in animal unit months available for livestock grazing within any given allotment.
- Project development or operational activities reduce or eliminate the opportunity to run the livestock of choice.

Assumptions for the analysis of range/livestock grazing impacts include the following:

- Potential project-related disturbance will be depicted on GIS files and quantified in the description of the Applicant's Proposed Alternative for use in the analysis of impacts to various resources including range.
- Although a variety of vegetation communities, each with different forage characteristics, occur throughout the Application Area, the range impact analysis will generally assume uniform forage characteristics across most allotments. Where individual allotments encompass broad elevational ranges, the allotments will be partitioned into upper and lower zones to reflect the major differences in vegetation composition and productivity. Therefore, potential loss of AUMs

will be based directly on affected acreage and the average AUMs per acre within each allotment or elevational zone of the allotment.

- Livestock operations within the Application Area can be adjusted in a manner (through pasture rotation, etc.) to reduce conflicts with major construction activities in specific portions of the area if construction is staged in different segments of the area. Where necessary, it is assumed that the larger operators within the area will cooperate with smaller operations to provide flexibility of grazing resources during periods of construction activities. The possibility of using the Grizzly allotment as a grass bank to facilitate such flexibility has been raised and may represent a potential mitigation measure.
- Projections of existing and project-related vehicle traffic will be available through the transportation section of the NEPA document and traffic-related impacts to livestock grazing can be extrapolated in direct proportion to projected changes in traffic volume.
- Initial reclamation efforts (topsoil replacement and seeding) will occur on all temporary disturbance areas within 1 year after disturbance activities have ceased. It is assumed that for most of the area, effective reclamation will be achieved within a period of 5 years to vegetation conditions providing livestock forage comparable to the pre-disturbance conditions.
- All access roads will be closed and reclaimed during project decommissioning, subject to the determination by the BLM, State of Wyoming, and private landowners.
- Calculation of AUMs affected by disturbance areas within the Pine Grove/Bolten allotment are calculated on the basis of the federal acreage determined by GIS analysis and federal AUM data as provided through personal communication with the BLM (Newberry 2010b):
  - Chokecherry portion of Pine Grove/Bolten Allotment = 10 acres/AUM
  - Sierra Madre portion of Pine Grove/Bolten Allotment = 6 acres/AUM
- Calculation of AUMs affected by disturbance areas on other allotments are calculated on the basis of federal acreage and federal AUM data presented in Appendix 29 of the Rawlins RMP (BLM 2008a) with resultant acres/AUM as shown in **Table 3.6-1**. It is assumed that these data are representative of each allotment as a whole.
- Calculation of AUMs affected by deposition of fugitive dust from traffic on unpaved roadways is based on an assumed effective width of deposition of 150 feet on both the downwind and upwind sides of the road, nominal wind speed of 10 mph, and vehicle speed of 25 mph for particles >130 μm. This equates to an affected area of approximately 36.36 acres per mile of roadway. This method of calculation was adopted from the Atlantic Rim Natural Gas Project Final EIS (BLM 2006).
- Calculations of disturbance acreages are based on GIS data and may not add up to the Application Area numbers due to the fact that only allotment impact acreage is being considered. Non-allotment impact acreage is not part of this discussion.

4.6.1 Impacts to Range from the No Action Alternative

The No Action Alternative would involve the BLM's denial of the applicant's request to develop on public lands and their request for access to private lands for wind development plus the assumption that the State of Wyoming would restrict development on private and state lands in the Application Area, or the proponent's choice not to proceed. Therefore, the No Action Alternative would be a continuation of existing land uses in this area without any project-related development. To the extent that range impacts are occurring, albeit minor, from traffic on existing unpaved roads in the area and dust emissions related to such activity, such impacts would continue without change.

4.6.2 Impacts to Range from Alternative 1R, Applicant Proposed Alternative

The primary impact to range from Alternative 1R during the construction phase includes surface disturbance of 7,061 acres of rangeland resulting in the temporary loss of approximately 923 AUMs of forage until effective reclamation is achieved on a portion of this area. The **Table 4.6-2** shows the expected distribution of this impact among the affected allotments. Grazing permit modifications would be addressed through separate NEPA actions and related decisions.

Additional rangeland impacts related to forage loss would occur as a result of dust deposition on vegetation along unpaved roads within the Application Area. The effective width of affected area is assumed to be approximately 150 feet wide on either side of the road for deposition of particles larger than approximately <130 µm diameter. This width was selected on the basis of projected depositional characteristics for different sized particles as discussed in AP 42 (USEPA 1995) and professional judgment. This results in a potentially affected area of approximately 36.36 acres per mile of roadway. The degree to which dust deposition may reduce forage palatability would depend on several factors such as frequency and effectiveness of road watering or other dust control measures, frequency and timing of precipitation to wash dust from the vegetation, type and general condition of the affected plants, and availability of palatable forage elsewhere within the pasture. With construction of 347.2 miles of unpaved roads within affected allotments under Alternative 1R, the potentially affected area of vegetation amounts to approximately 12,625 acres or up to 1,673 AUMs if the entire area is rendered unpalatable. This loss would be distributed among the affected allotments as shown in **Table 4.6-2**. The combination of this loss, coupled with the direct disturbance loss, represents approximately 8.2 percent of the currently available AUMs on the affected allotments within the Application Area. This does not qualify as a potentially significant impact to overall rangeland health and livestock grazing, but would be locally significant within individual pastures.

Table 4.6-2 Alternative 1R Construction and Project Operation Impacts

Construction			
Allotments	**Surface Disturbance**	**Percent Surface Acreage Disturbance**	**Dust Deposition/Unpaved Roads**
Cottonwood Draw	56 acres; 10 AUMs	3.7	2.4 miles; 15 AUMs
Middlewood Hill	30 acres; 6 AUMs	3.6	1.8 miles; 14 AUMs
Pine Grove/Bolten	6,937 acres; 898 AUMs	8.4	340.9 miles; 1,627 AUMs
Sage Creek	38 acres; 9 AUMs	0.2	2.1 miles; 18 AUMs
Sixteen Mile	No Loss	0.0	No Loss
Sulphur Springs	No Loss	0.0	No Loss
Total	**7,061 acres; 923 AUMs**	**6.5**	**347 miles; 1,673 AUMs**
Project Operations			
Cottonwood Draw	11 acres; 2 AUMs	0.7	2.4 miles; 15 AUMs
Middlewood Hill	6 acres; 1 AUM	0.7	1.8 miles; 14 AUMs
Pine Grove/Bolten	1,299 acres; 169 AUMs	1.6	340.9 miles; 1,627 AUMs
Sage Creek	7 acres; 2 AUMs	<0.1	2.1 miles; 18 AUMs
Sixteen Mile	No Loss	0.0	No Loss
Sulphur Springs	No Loss	0.0	No Loss
Total	**1,323 acres; 174 AUMs**	**1.2**	**347 miles; 1,673 AUMs**

Along with the reduced palatability of forage, dust generated from roadways may contribute to respiratory problems for livestock and wildlife. Airborne dust is a common respiratory irritant for animals, particularly young animals. In cattle, it can contribute to viral and bacterial infections resulting in bovine respiratory disease (bronchial pneumonia, or “dust pneumonia”) which is frequently fatal in calves. Adult animals are typically less susceptible. Thus, the presence of dust from roadways and construction areas, particularly during the construction phase, may constrain the types and kinds of livestock (e.g., mature animals only) suitable for grazing these pastures.

The accumulation of dust on vegetation, particularly broad-leafed forbs with nearly horizontal leaf surfaces, also may reduce photosynthetic capability of the plants and thereby influence changes in the plant communities adjacent to the roadways over the long-term. As with the palatability effects, the degree of this influence would be affected by such factors as wind conditions, frequency of precipitation, and susceptibility of the various species involved. For example, some weedy species such as sunflower and cocklebur thrive in dusty roadside environments if adequate soil moisture is available for their growth. The area of impact to plant physiology and potential community composition is expected to be narrower than that considered above for palatability effects since a greater accumulation of dust on leaf surfaces is expected to be necessary for these impacts.

In addition to impacts to forage, losses from direct disturbance and from dust deposition, it is expected that the intensive construction activities will lead to shifts in grazing patterns and possible avoidance of some water sources, thereby resulting in overutilization of areas remote from construction and underutilization of areas with heavy activity. These impacts are not expected to be uniformly distributed throughout an allotment, but instead will likely be more pronounced in some drainages than others.

Rangeland impacts during the project operations phase would be similar in nature to those discussed above but reduced in magnitude as portions of the disturbed surface from construction are revegetated. The long-term (life-of-project) disturbance area to rangeland would be reduced to 1,323 acres, distributed among allotments as shown in **Table 4.6-2**. The length of unpaved roadways would remain at 347.2 miles, but traffic volumes would be expected to decrease substantially based on the limited level of routine monitoring and maintenance for the operating wind generation system. Thus, dust generation and loss of AUMs is expected to be substantially reduced on the long-term basis in comparison with the construction period, but the dispersion pattern would remain the same.

During the decommissioning phase of the project, areas remaining disturbed during the operations phase would be revegetated and returned to approximately pre-disturbance conditions. Reclamation procedures would include, but are not limited to, regrading, spreading of topsoil, and revegetation of all disturbed areas.

Risk of vehicle-livestock collisions would be closely related to the total number and diversity of personnel working on the project site. Likelihood of livestock collisions also would depend on the types and kinds of livestock in the area, since cow/calf pairs would be more at risk than yearlings. Thus the risk would be moderate during the construction phase, low during the operations phase, increasing during decommissioning, and return to pre-construction levels following decommissioning of the project. The risk of livestock-vehicle collisions during all phases of the project would be reduced by the posting and strict obeyance of speed limit signs as shown in **Appendix C**, **Table C-3** under the Air – Dust Control section.

Risk of livestock losses due to straying as a result of fence or gate damage similarly would be greatest during the construction phase when numerous contractors are working on the site. This risk likely would return to near pre-construction levels during the operations phase when fewer personnel are conducting maintenance, monitoring, and occasional repairs. The risk would be similar to pre-construction conditions following decommissioning. Risk of livestock losses due to theft would be related to the accessibility of the area, particularly remote regions, during nighttime hours or periods of construction

and operational inactivity. Thus, the risk likely would be highest during the operational phase of the project when maintenance activities are limited in frequency.

Road construction and other surface disturbances in those areas where noxious weeds and poisonous plants are present may contribute to further spread of these species. Although the POD includes BMPs regarding prevention of weed and poisonous plant introductions into the Application Area, additional precautions will be advisable for construction and maintenance activities in and around areas where known populations already exist. Introduction or expansion of weed populations in the Application Area also represents a threat for similar introduction into adjoining allotments. Known populations of poisonous plants include concentrations of halogeton (along pipeline ROWs and larkspur in the northern portion of the Chokecherry area and woody aster, which is a selenium accumulator, in the Sage Creek Basin.

Impacts to allotments adjoining the Application Area also would occur in relation to the enhanced road access provided by project development. This enhanced access into formerly remote areas could contribute to increased vandalism, fence damage; gates left open, and livestock straying or theft. The level of increased risk associated with such issues is impossible to estimate, but is not likely to be a serious problem for management of these adjoining allotments.

4.6.3 Impacts to Range from Alternative 2, Checkerboard Only

Rangeland surface disturbance under Alternative 2 would be 8,170 acres or an increase of approximately 15.7 percent over that associated with Alternative 1R (**Table 4.6-3**). This translates to a loss of 1,027 AUMs or an increase of 104 additional AUMs in comparison to Alternative 1R. This alternative would involve no surface disturbance within the Sage Creek allotment; all activity would be within the Pine Grove/Bolten allotment. Grazing permit modifications would be addressed through separate NEPA actions and related discussions.

Dust deposition on vegetation would be associated with 427 miles of unpaved roadway, an increase of 23.1 percent above Alternative 1R. This translates to a loss of 1,956 AUMs or an increase of 283 additional AUMs in comparison with Alternative 1R. The combination of this loss, coupled with the direct disturbance loss, represents approximately 9.4 percent of the currently available AUMs on the Application Area portion of the Pine Grove/Bolten allotment. As stated for Alternative 1R, this level of disturbance would be locally significant within individual pastures and borders on the level of being significant for the overall Application Area.

Along with the reduced palatability of forage, dust generated from roadways may contribute to respiratory problems for livestock and wildlife. Airborne dust is a common respiratory irritant for animals, particularly young animals. In cattle, it can contribute to viral and bacterial infections resulting in bovine respiratory disease (bronchial pneumonia, or “dust pneumonia”), which is frequently fatal in calves. Adult animals are typically less susceptible. Thus, the presence of dust from roadways and construction areas, particularly during the construction phase, may constrain the types and kinds of livestock (e.g., mature animals only) suitable for grazing these pastures.

The accumulation of dust on vegetation, particularly broad-leafed forbs with nearly horizontal leaf surfaces, also may reduce photosynthetic capability of the plants and thereby influence changes in the plant communities adjacent to the roadways over the long-term. As with the palatability effects, the degree of this influence would be affected by such factors at wind conditions, frequency of precipitation, and susceptibility of the various species involved. For example, some weedy species such as sunflower and cocklebur thrive in dusty roadside environments if adequate soil moisture is available for their growth. The area of impact to plant physiology and potential community composition is expected to be narrower than that considered above for palatability effects since a greater accumulation of dust on leaf surfaces is expected to be necessary for these impacts.

Effects on grazing patterns and use of water sources would occur as with Alternative 1R, but would be distributed differently based on the different areas of construction activity in this alternative.

Risk of vehicle-livestock collisions would be similar to Alternative 1R since the total traffic volumes in each project phase would be similar to that alternative.

Risk of livestock losses due to straying or theft would be similar to Alternative 1R since the levels of construction and operational activities would be similar to that alternative.

Table 4.6-3 Alternative 2 Construction and Project Operation Impacts

Construction			
Allotments	**Surface Disturbance**	**Percent Surface Acreage Disturbance**	**Dust Deposition/ Unpaved Roads**
Cottonwood Draw	66 acres; 11 AUMs	4.4	3.8 miles; 24 AUMs
Middlewood Hill	41 acres; 9 AUMs	5.0	2.4 miles; 19 AUMs
Pine Grove/Bolten	8,044 acres; 1,005 AUMs	9.8	420.6 miles; 1,913 AUMs
Sage Creek	2 acres; 0 AUMs	<0.1	0.1 miles; 1 AUM
Sixteen Mile	17 acres; 2 AUMs	<0.1	No Loss
Sulphur Springs	No Loss	0.0	No Loss
Total	**8,170 acres; 1,027 AUMs**	**4.3**	**427 miles; 1,956 AUMs**
Project Operations			
Cottonwood Draw	13 acres; 2 AUMs	0.9	3.8 miles; 24 AUMs
Middlewood Hill	8 acres; 2 AUMs	1.0	2.4 miles; 19 AUMs
Pine Grove/Bolten	1,531 acres; 192 AUMs	1.9	420.6 miles; 1,913 AUMs
Sage Creek	No Loss	0.0	0.1 miles; 1 AUM
Sixteen Mile	3 acres; 0 AUMs	<0.1	No Loss
Sulphur Springs	No Loss	0.0	No Loss
Total	**1,555 acres; 196 AUMs**	**0.9**	**427 miles; 1,956 AUMs**

4.6.4 Impacts to Range from Alternative 3, No Miller Hill or Sierra Madre

Rangeland surface disturbance under Alternative 3 would be 8,048 acres or an increase of approximately 14.0 percent over that associated with Alternative 1R (**Table 4.6-4**). This translates to a loss of 988 AUMs or an increase of 65 additional AUMs in comparison to Alternative 1R. This alternative would involve no surface disturbance within the Sage Creek allotment; all activity would be within the Pine Grove/Bolten Allotment. Grazing permit modifications would be addressed through separate NEPA actions and related discussions.

Dust deposition on vegetation would be associated with 422 miles of unpaved roadway, an increase of 21.6 percent above Alternative 1R. This translates to a loss of 1,886 AUMs or an increase of 213 additional AUMs in comparison with Alternative 1R. The combination of this loss, coupled with the

direct disturbance loss, represents approximately 9.1 percent of the currently available AUMs on the Application Area portion of the Pine Grove/Bolten Allotment. As stated for Alternative 1R, this level of disturbance would be locally significant within individual pastures and borders on the level of being significant for the overall Application Area.

Table 4.6-4 Alternative 3 Construction and Project Operation Impacts

Construction			
Allotments	**Surface Disturbance**	**Percent Surface Acreage Disturbance**	**Dust Deposition/ Unpaved Roads**
Cottonwood Draw	61 acres; 11 AUMs	4.1	3.6 miles; 22 AUMs
Middlewood Hill	41 acres; 9 AUMs	5.0	2.4 miles; 19 AUMs
Pine Grove/Bolten	7,927acres; 966 AUMs	9.7	416.2 miles; 1,854 AUMs
Sage Creek	1 acres; 0 AUMs	<0.1	No Loss
Sixteen Mile	17 acres; 2 AUMs	<0.1	No Loss
Sulphur Springs	No Loss	0.0	No Loss
Total	**8,048 acres; 988 AUMs**	**4.2**	**422 miles; 1,886 AUMs**
Project Operations			
Cottonwood Draw	13 acres; 2 AUMs	0.9	3.6 miles; 22 AUMs
Middlewood Hill	8 acres; 2 AUMs	1.0	2.4 miles; 19 AUMs
Pine Grove/Bolten	1,497 acres; 182 AUMs	1.8	416.2 miles; 1,854 AUMs
Sage Creek	No Loss	0.0	No Loss
Sixteen Mile	3 acres; 0 AUMs	<0.1	No Loss
Sulphur Springs	No Loss	0.0	No Loss
Total	**1,521 acres; 186 AUMs**	**0.9**	**422 miles; 1,886 AUMs**

Along with the reduced palatability of forage, dust generated from roadways may contribute to respiratory problems for livestock and wildlife. Airborne dust is a common respiratory irritant for animals, particularly young animals. In cattle, it can contribute to viral and bacterial infections resulting in bovine respiratory disease (bronchial pneumonia, or “dust pneumonia”) which is frequently fatal in calves. Adult animals are typically less susceptible. Thus, the presence of dust from roadways and construction areas, particularly during the construction phase, may constrain the types and kinds of livestock (e.g., mature animals only) suitable for grazing these pastures.

The accumulation of dust on vegetation, particularly broad-leafed forbs with nearly horizontal leaf surfaces, also may reduce photosynthetic capability of the plants and thereby influence changes in the plant communities adjacent to the roadways over the long term. As with the palatability effects, the degree of this influence would be affected by such factors at wind conditions, frequency of precipitation, and susceptibility of the various species involved. For example, some weedy species such as sunflower and cocklebur thrive in dusty roadside environments if adequate soil moisture is available for their growth. The area of impact to plant physiology and potential community composition is expected to be

narrower than that considered above for palatability effects since a greater accumulation of dust on leaf surfaces is expected to be necessary for these impacts.

Effects on grazing patterns and use of water sources would occur as with Alternative 1R, but would be distributed differently based on the different areas of construction activity in this alternative.

Risk of vehicle-livestock collisions would be similar to Alternative 1R since the total traffic volumes in each project phase would be similar to that alternative.

Risk of livestock losses due to straying or theft would be similar to Alternative 1R since the levels of construction and operational activities would be similar to that alternative.

4.6.5 Impacts to Range from Alternative 4, Private Lands Only

Rangeland surface disturbance under Alternative 4 would be 8,170 acres or an increase of approximately 15.7 percent over that associated with Alternative 1R, but all tower installations, and the majority of surface disturbance, would occur on private lands rather than the combination of public and private lands involved in the other alternatives (**Table 4.6-5**). This translates to a loss of 1,009 AUMs or an increase of 86 additional AUMs in comparison to Alternative 1R. Grazing permit modifications would be addressed through separate NEPA actions and related decisions.

Dust deposition on vegetation would be associated with 465 miles of unpaved roadway, an increase of 42.4 percent above Alternative 1R. This translates to a loss of 2,024 AUMs or an increase of 351 additional AUMs in comparison with Alternative 1R. The combination of this loss, coupled with the direct disturbance loss, represents approximately 9.6 percent of the currently available AUMs on the affected allotments within the Application Area. As stated for Alternative 1R, this level of disturbance would be locally significant within individual pastures and borders on the level of being significant for the overall Application Area.

Along with the reduced palatability of forage, dust generated from roadways may contribute to respiratory problems for livestock and wildlife. Airborne dust is a common respiratory irritant for animals, particularly young animals. In cattle, it can contribute to viral and bacterial infections resulting in bovine respiratory disease (bronchial pneumonia, or “dust pneumonia”) which is frequently fatal in calves. Adult animals are typically less susceptible. Thus, the presence of dust from roadways and construction areas, particularly during the construction phase, may constrain the types and kinds of livestock (e.g., mature animals only) suitable for grazing these pastures.

The accumulation of dust on vegetation, particularly broad-leafed forbs with nearly horizontal leaf surfaces, also may reduce photosynthetic capability of the plants and thereby influence changes in the plant communities adjacent to the roadways over the long-term. As with the palatability effects, the degree of this influence would be affected by such factors at wind conditions, frequency of precipitation, and susceptibility of the various species involved. For example, some weedy species such as sunflower and cocklebur thrive in dusty roadside environments if adequate soil moisture is available for their growth. The area of impact to plant physiology and potential community composition is expected to be narrower than that considered above for palatability effects since a greater accumulation of dust on leaf surfaces is expected to be necessary for these impacts.

Effects on grazing patterns and use of water sources would occur as with Alternative 1R, but would be distributed differently based on the different areas of construction activities in this alternative.

Risk of vehicle-livestock collisions would be similar to Alternative 1R since the total traffic volumes in each project phase would be similar to that alternative.

Table 4.6-5 Alternative 4 Construction and Project Operation Impacts

Construction			
Allotments	**Surface Disturbance**	**Percent Surface Acreage Disturbance**	**Dust Deposition/ Unpaved Roads**
Cottonwood Draw	29 acres; 5 AUMs	1.9	2.0 miles; 12 AUMs
Middlewood Hill	No Loss	0.0	No Loss
Pine Grove/Bolten	8,026 acres; 979 AUMs	9.8	446.9 miles; 1,981 AUMs
Sage Creek	98 acres; 23 AUMs	0.4	3.7 miles; 31 AUMs
Sixteen Mile	17 acres; 2 AUMs	<0.1	No Loss
Sulphur Springs	No Loss	0.0	No Loss
Total	**8,170 acres; 1,009 AUMs**	**4.3**	**465 miles; 2,024 AUMs**
Project Operations			
Cottonwood Draw	6 acres; 1 AUM	0.4	2.0 miles; 12 AUMs
Middlewood Hill	No Loss	0.0	No Loss
Pine Grove/Bolten	1,537 acres; 187 AUMs	1.9	446.9 miles; 1,981 AUMs
Sage Creek	12 acres; 3 AUMs	<0.1	3.7 miles; 31 AUMs
Sixteen Mile	3 acres; 0 AUMs	<0.1	No Loss
Sulphur Springs	No Loss	0.0	No Loss
Total	**1,558 acres; 191 AUMs**	**0.8**	**465 miles; 2,024 AUMs**

Risk of livestock losses due to straying or theft would be similar to Alternative 1R since the levels of construction and operational activities would be similar to that alternative.

4.6.6 Mitigation and Mitigation Effectiveness

All Action Alternatives would incorporate ACMs and BMPs described in Chapter 2.0 and found in **Appendix C**.

GEN-1: The phased construction mitigation sequence (GEN-1) schedule and the components to be constructed are discussed in Section 2.2, General Project Description, and **Appendix A**, Section A.1.3.1. The annual disturbance associated with the phased construction mitigation sequence varies only slightly compared to the other action alternatives; however the disturbance areas would be more isolated and the reclamation process would be initiated sooner within the respective areas.

Effectiveness: Overall, the phased construction mitigation sequence has little effect on the project's net disturbance. However, there are a few benefits related to the timing of the phased construction mitigation sequence. Limiting surface disturbances to areas where turbine construction is no more than 12 months out would avoid unnecessary disturbance in the event that project construction plans change and fewer turbines are installed than originally expected.

The threat of spreading and introducing noxious/invasive weeds would potentially be reduced since construction would occur in isolated areas as opposed to a construction sequence plan where all of the proposed roads are constructed within a condensed time frame throughout the entire Application Area. The potential for spread of noxious/invasive weeds would still exist, but would include smaller areas within a given period of time.

Vegetation reclamation may be more successful under the phased construction mitigation sequence since top soils would not need to be stored for more than 1 year. This should improve the viability of the seed bed and enhance the re-establishment of new vegetation for livestock grazing.

Throughout the Application Area, impacts to forage quality due to dust deposition would be reduced. This would largely be the result of isolated construction areas as opposed to construction sequence that would affect the entire Application Area simultaneously. Isolating construction to smaller areas within a given period of time would potentially allow livestock operators to utilize larger portions of their pastures by rotating livestock away from areas that are near construction sites.

Range-1: Coordinate construction schedules and ranching operations to allow sequencing of pasture use to the extent practicable within the Pine Grove/Bolten allotment and other affected allotments (Cottonwood Draw, Middlewood Hill, Grizzly, McCarty Canyon, and Sage Creek) in a manner to minimize conflicts between grazing and construction activities.

Effectiveness: Keeping livestock away from the primary construction sites will reduce the potential for vehicle/livestock collisions and loss of livestock from straying through gates left open or fences left down during construction activities. Shifts away from cow-calf operations may be considered necessary in pastures affected by heavy construction activity based on potential dust impacts to young animals.

The Pine Grove/Bolten allotment is the only allotment in the Application Area that comes close to the 10 percent disturbance significance criteria. Because both PCW and TOTCO are wholly owned affiliates of The Anschutz Corporation, the involved parties would be responsible for negotiating compensation.

4.6.7 Residual Impacts

The Air-Dust Control applicant-committed BMP's will reduce the impacts of dust generated by construction activities. The Phased Construction Mitigation Sequence may enable the operators of larger allotments to coordinate their pasture rotations to avoid cow-calf grazing near construction areas and mitigation measure Range-1 also will help to reduce potential conflicts between livestock operators and construction activities. Livestock operators may consider adjusting away from cow-calf operations in pastures affected by heavy construction activity based on potential dust impacts to young animals that are more susceptible to Bovine Respiratory Disease.

4.6.8 Irreversible and Irretrievable Commitment of Resources

The anticipated impacts to the range resource are not considered irreversible. The forage production lost during the construction and operation phases of the project would be irretrievable, but the reduced production levels would be reversible following decommissioning of the project.

4.6.9 Relationship between Local Short-term Uses and Long-term Productivity

Forage productivity of the Application Area would be reduced during the life of the project (30 years or greater, but most pronounced during the construction phase), but could be restored through effective reclamation of all disturbed areas following project decommissioning.

4.7 Impacts to Recreation

Recreation is one of the primary uses within the CCSM Wind Energy Project analysis area. In general, none of the alternatives analyzed in this EIS would result in long-term, widespread effects on the availability of recreational opportunities and/or experiences within the analysis area, although the quality of recreational experiences may be affected from potential degradation of visual resources. Access to some dispersed use opportunities may be limited during the construction phase and potentially increased during operations. Development of the project would substantially change the general landscape character of the analysis area (in particular, when viewed from some recreation sites and use areas). This change is anticipated to result in significant short-and long-term effects to visual resources and would significantly degrade the recreational experiences of some visitors to the analysis area, including in the more sensitive CDNST and North Platte River corridors (Section 4.12, Impacts to Visual Resources).

While the impact analysis considers all recreation resources within the analysis area (which includes the Application Area, as well as surrounding recreation sites and use areas that are generally within the larger visual resource analysis area in Section 4.12, Impacts to Visual Resources) the focus is on those recreation sites, use areas, and activities that are located or occur within the Application Area or where the visitor experience may be affected as a result of the proposed project. That said the visitor experience in adjacent areas (outside of the Application Area) will most likely be influenced by the scenic effect of the proposed project. The visual resource analysis area extends 30 miles from proposed project facilities as shown on **Figure 4.12-1**. Since visual resources and associated project impacts are discussed in Section 4.12, Impacts to Visual Resources, including potential effects on the public and recreation visitors, they are generally not addressed or repeated here. However, other potential effects, such as access limitations on roads and waterways with public ROW, are addressed for adjacent recreation sites and use areas.

Multiple recreation-related issues were identified during the public scoping process. Specifically, scoping participants indicated reduced or limited public access, reduced wildlife viewing and hunting opportunities, scenic resource degradation, and site or use area or trail-specific concerns, among others (BLM 2009). Some of these scoping issues also may be referenced in other appropriate sections of Chapter 4.0. In particular, potential effects on public access effects are discussed in Section 4.4, Impacts to Land Use; scenic resources effects on the related visitor experience are described in Section 4.12, Impacts to Visual Resources; and big game migration and hunting opportunities are described in Section 4.14, Impacts to Wildlife and Fisheries Resources.

Recreation on public lands in the analysis area is managed per the direction set forth in the BLM Rawlins RMP/ROD (BLM 2008). This includes specific management goals and objectives for the CDNST and the North Platte River SRMA. The Rawlins RMP/ROD and pertinent recreation resource management considerations, as well as the FLPMA are listed in **Table 4.7-1**.

Table 4.7-1 Relevant Management Considerations for Recreation

BLM RMP and ROD – Recreation and Visitor Services[1] (Volume 1, Chapter 2, pages 2-42)
<u>Management Goals</u> • Ensure the continued availability and accessibility of outdoor recreational opportunities. • Manage recreation resources to accommodate existing and future uses.
<u>Management Objectives</u> • Provide for the health and safety of visitors. • Coordinate with other programs to minimize conflicts and adverse impacts on recreational opportunities.

Table 4.7-1 Relevant Management Considerations for Recreation

• In the Western Extensive Recreation Management Area (ERMA, located in the eastern portion of the Application Area), consider the above recreation objectives during development involving surface disturbing or disruptive activity. • In the Eastern ERMA (the western portion of the Application Area), retain the quality of dispersed recreation opportunities and settings (with the exception of isolated development areas, such as coal mines or wind generation facilities) while meeting the above recreation objectives. • Provide public education regarding appropriate use of BLM lands. • Provide opportunities for public use, interpretation, education, and appreciation of natural and cultural resources.
BLM RMP and ROD – CDNST (Volume 1, Chapter 2, pages 2-43, 2-44)
Management Goals • Manage to emphasize interpretive and educational opportunities. • Ensure the continued availability of outdoor recreation opportunities associated with the CDNST.
Management Objectives Comply with the CDNST Comprehensive Plan • Provide users with opportunities to view, experience, and appreciate examples of prehistoric and historic human use of the resources along the Continental Divide, and examples of the ways these resources on public lands are being managed in harmony with the environment, as an asset to the existing character of the Continental Divide, and which will not detract from the overall experience of the trail. • Provide a route that will have a minimum adverse effect on adjacent natural and cultural environments and harmonize with the management objectives of land and resource uses that are now or may be occurring on the lands through which the trail passes. • Maintain and enhance recreation opportunities for residents and visitors to the area to accommodate camping, wildlife viewing, and other compatible uses in prescribed settings so visitors are able to realize experiences and benefits. • Pursue opportunities for partnership and cooperative management with adjacent property owners.
North Platte River SRMA (Volume 1, Chapter 2, pages 2-45, 2-46)
Management Goal • Manage to ensure the continued availability of outdoor recreation opportunities associated with the North Platte and Encampment Rivers.
Management Objectives • Maintain or enhance recreation opportunities to accommodate existing niche activities, including hunting, fishing, camping, wildlife viewing, OHV touring, and other uses appropriate to the prescribed setting. • Mitigate conflicts with other resource values and uses as appropriate, in coordination and cooperation with affected interests. • Maintain or improve the quality of river-related recreational experience along the North Platte and Encampment rivers to continue to provide high-quality recreational experiences and benefits to local residents and visitors to the area (Table 2-11).

Table 4.7-1 Relevant Management Considerations for Recreation

FLPMA – Declaration of Policy[2]
"…the public lands be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values; that, where appropriate, will preserve and protect certain public lands in their natural condition; that will provide food and habitat for fish and wildlife and domestic animals; and that will provide for outdoor recreation and human occupancy and use…"

[1] BLM 2008a.

[2] BLM 2001.

The general method for identifying potential recreation impacts and developing significance criteria for the impacts within the analysis area included reviewing existing data sources and interviews with BLM recreation specialists, recreation visitors, and recreation providers. Using these forms of information, potential effects were assessed by quantifying the extent to which the project would impact recreation, including recreational opportunities, experiences, and access. Potential recreational impacts resulting from each of the alternatives were identified using this methodology. Potential impacts (both short- and long-term) in the analysis area were considered significant if they met one of the following significance criteria:

- Project would compromise public health and safety at recreation sites and use areas.
- Project would limit or restrict public access to developed recreation sites and/or dispersed use areas, including those located along the North Platte River.
- Intensity of development is incompatible with the stated objectives of the CDNST and/or North Platte River SRMAs.

Finally, the recreation impact analysis was conducted using the following assumptions:

- It is anticipated that most recreational resources in the analysis area are located primarily on BLM lands that are not within the checkerboard land ownership pattern, which has limited public access; however other public land, such as USFS lands, also may be affected.
- It is anticipated that a smaller number of state, county, municipal, and privately operated recreation facilities, such as parks and reservoirs, also may be affected.
- Management plans, ROWs, lease information, and any other supporting documentation provided by the requisite governing bodies are the most current and available for public use and review.

4.7.1 Impacts to Recreation from No Action

Under the No Action Alternative, there would be no anticipated impacts to recreation as the proposed project would not be developed. Under this alternative, the BLM would prohibit development on their lands, as well as access to private lands for wind energy projects. Furthermore, the State of Wyoming would restrict development on private and state lands in the Application Area. The combined result of these restrictions would be to prohibit the development of the project in the Application Area. Overall, recreational resource opportunities would generally remain unchanged under the No Action Alternative.

4.7.2 Impacts to Recreation from Alternative 1R, Applicant Proposed Alternative

Under Alternative 1R, 1,000 WTGs and associated facilities (e.g., transmission lines, roads, etc.) would be developed as illustrated on **Figure 2-3** on both public and private land. The proposed project would

be almost entirely located within the existing boundary of the Overland Trail Ranch. Overall, the construction and operation of the proposed project is not anticipated to preclude recreation activities and/or limit public access to recreational opportunities. It would, however, significantly affect visual resources in the analysis area (as described in Section 4.12, Impacts to Visual Resources), which would substantially degrade the recreational experience in the analysis area for some visitors. Specific project effects on recreation are discussed in greater detail below by phase of the project (construction and operation).

Construction

During construction, the analysis area would experience increased traffic, the presence of construction crews and equipment, noise, and dust. However, the proposed siting of project components under Alternative 1R would help minimize the effects of construction activities on recreation in the analysis area. In particular, construction activities would not limit access to developed recreation sites and use areas in the analysis area, such as the Rim Lake and Teton Reservoir recreation sites, though increased traffic along analysis area roads from construction vehicles may create temporary delays/congestion. To the extent practical, all heavy trucks will use internal haul roads, significantly reducing impact-related traffic on public roads. Construction activities also may be visible from these developed recreation locations. Activities that may be visible to recreation visitors may include traffic (and fugitive dust), worker activity/movement, staging areas, and construction of project facilities. A full description of visible construction activities and associated effects is provided in Section 4.12, Impacts to Visual Resources. Short-term construction-related effects would degrade the recreational experience for some visitors at developed sites (as well as dispersed use areas). WTGs and other project facilities would be sited a minimum of one mile from both the CDNST and the North Platte River corridor (along the eastern boundary of the Overland Trail Ranch boundary) under Alternative 1R. This would limit any access restrictions, as well as help minimize visual and noise effects on the recreational experience in these areas.

Dispersed uses and activities (e.g., OHV use, camping, hunting, and fishing) may be temporarily disrupted during construction of the proposed project under Alternative 1R. While dispersed uses tend to be limited on public lands within the analysis area south of Township Line 18N, any dispersed uses that may occur at or adjacent to project components (e.g., WTGs, transmission lines) would be restricted for safety and security during construction. These types of safety and security restrictions would be limited in geographic scope since construction activities are only anticipated to disrupt about 3.3 percent of the alternative area. So, construction related activities may temporarily affect dispersed recreation use in specific locations, but would not result in widespread access limitations or degradation of the recreational experience south of Township Line 18N.

North of T17N, public access to dispersed recreation opportunities is already restricted due to the mixed public and private land ownership in the checkerboard area. Increased construction-related traffic would directly and indirectly affect public access to some dispersed areas in the Sierra Madre site south of T18N from the increase in heavy truck traffic on public roads. Potential impact to public access to recreation opportunities include an increased safety hazard from large vehicles on public roads, and the inconvenience of increased traffic levels on public roads. Construction-related traffic also would temporarily create noise and fugitive dust intrusions that would be perceived as an adverse impact to the quality of dispersed recreation activities, such as camping, that may occur in relatively close proximity to roads. The effects from construction traffic would occur over the 9-year construction and reclamation period, but localized to specific areas for relatively short durations of time according to the construction schedule. Recreationists may choose to avoid the area during construction.

Construction activities would affect the quality of dispersed recreation activities and may reduce the level of public use. Public lands which provide dispersed recreation opportunities in the Alternative 1R area occur only south of T18N in the Sierra Madre site, and account for a relatively small proportion of the area. Potential effects include the displacement of recreation opportunities such as camping and hunting,

and the intrusion of the sight and sound of construction activities on recreation activities. These effects would degrade the experience of visitors to the CDNST and the North Platte River SRMA for the duration of construction activities at sites within viewsheds or within hearing distance of recreation activities. The visual impact of construction, noise effects, and the sight of fugitive dust from construction traffic and construction activities would attract the attention of the public within the Alternative 1R area south of T18N, and would likely degrade the recreational experience of some visitors to dispersed use areas during the 9-year construction and reclamation period. The visual effects from the construction of proposed facilities are evaluated in Section 4.12, Impacts to Visual Resources. Because dispersed recreation opportunities on public lands are affected in a relatively small area, there would generally be sufficient public land with similar recreation opportunities in nearby areas within the RFO planning area to absorb the relatively small number of recreationists displaced by construction activities.

Indirect effects from construction on recreation (both developed and dispersed), including changes in adjacent area use levels and/or displacement of visitors by transient workers (at campgrounds), may occur, but are not anticipated to be long-term or significant. There would be no discernible indirect effect to the local economy from tourist-related revenues based on recreation opportunities in the Alternative 1R area. In general, public land outside of the checkerboard in the Alternative 1R area is used primarily by those members of the public who reside in the region. Hunting opportunities are widely available in the RFO. Any loss of hunting opportunities would likely be absorbed by surrounding public lands; therefore local business would likely not experience any significant loss of revenues based on a reduction of hunting opportunities.

There are potential impacts to public health and safety at dispersed recreation and use areas from hazards related to construction equipment and activities; however, impacts would be reduced to less than significant because the public would be restricted from entering construction areas. Existing public access to designated recreation sites and use areas would not be affected. Construction activities would occur at sites generally located at least 1 mile from the CDNST, Teton Reservoir, and North Platte River SRMA. Outdoor recreation opportunities associated with these areas would continue to be available; therefore the construction phase of the project is compatible with the stated objectives of these areas. Any degradation of the recreation experience from visual and noise intrusions would be short-term. There would be no significant effects to recreation from construction and operation of the proposed project.

Operation

During operation of the proposed project under Alternative 1R, the presence of project components (e.g., WTGs, transmission lines) is not expected to limit or prohibit access to any of the recreation sites and use areas in the analysis area. Similar to the construction phase of the project, public access at and adjacent to project components would be restricted for safety and security, though these restrictions are anticipated to be localized and not affect public access in the analysis area. New access roads may increase public access to dispersed recreational opportunities on block public lands. In the checkerboard portion of the analysis area, public access currently is and will be restricted within TOTCO boundary. This increase in public access is a long-term beneficial effect of the project under Alternative 1R.

The presence (site and sound) of the project under Alternative 1R may influence the recreational experience for some visitors in the analysis area. Project components would be highly visible from Rim Lake Recreation Site, Teton Reservoir Recreation Site, and dispersed use areas. However, the conceptual locations of project facilities under Alternative 1R would help minimize potential visual effects on the recreational experience in the particularly sensitive areas along the CDNST and North Platte River corridors, but would not completely mitigate potential effects. Project-related visual resource effects are described in more detail in Section 4.12, Impacts to Visual Resources. The proposed project would result in effects to visual resources, and would likely degrade the recreational experience of some but not all visitors to the analysis area. Operation of the project may indirectly degrade the recreational experience of hunters, anglers, OHV users, and other visitors to dispersed use areas, though the

operation of the project is not expected to preclude these types of uses. Potential indirect effects on hunting experiences (e.g., wildlife migration, success rates) are discussed in detail in Section 4.14, Impacts to Wildlife and Fisheries Resources.

Overall, the effects to the recreation resources or uses in the Alternative 1R area from the proposed project are not expected to be significant. While there would be site-specific access restrictions for safety and security reasons, the project would not result in widespread public access limitations or closures to developed recreation sites and dispersed use areas, including hunting, fishing, and OHV use areas. Unauthorized public access to federal portions of the checkerboard area may actually increase from the creation of new project access roads; however, authorized public access to this area would continue to be limited due to private land. The presence of the project is expected to affect visual resources, which may substantially alter or degrade the recreational experience for some visitors in the analysis area. These effects are described in Section 4.12, Impacts to Visual Resources. The proposed siting of project facilities under Alternative 1R generally avoids the more sensitive viewsheds along the CDNST and North Platte River corridors, and is generally compatible with applicable analysis area management plans. Upon decommissioning, no long-term recreational resource effects would be anticipated, as impacts from construction and/or operation of the proposed project would likely be reversible.

4.7.3 Impacts to Recreation from Alternative 2, Checkerboard Only

Under Alternative 2, 1,000 WTGs and associated facilities (e.g., transmission lines, roads, etc.) would be developed throughout the checkerboard portion of the Application Area (**Figure 2-4**) on both public and private land. Unlike Alternative 1R, no WTGs or associated facilities would be sited south of Township Line 18N. Similar to Alternative 1R, the proposed project under Alternative 2 would be almost entirely located within the existing boundary of the Overland Trail Ranch. In general and similar to Alternative 1R, the construction and operation of the proposed project under Alternative 2 is not anticipated to preclude recreational activities or limit public access to recreational opportunities beyond current conditions. Since the proposed project is expected to affect visual resources (Section 4.12, Impacts to Visual Resources), the recreational experience of some analysis area visitors would likely be degraded. Construction activities and related effects on recreation would be similar under Alternative 2 to those previously identified under Alternative 1R. Construction activities would generally not limit or restrict access, but would likely be visible from several sites and use areas (e.g., Rim Lake and Teton Reservoir recreation sites, dispersed use areas). Use would be temporarily restricted in some dispersed use areas for safety and security, but restrictions and closures would not be widespread since construction activities would only disrupt about 4.8 percent of the Alternative 2 area. Construction activities and traffic also would temporarily affect some dispersed uses along access roads; and while these effects will be short-term and highly localized. WTGs and other project components also would be sited away from the CDNST corridor under Alternative 2, but would be located closer to the North Platte River corridor than under Alternative 1R. Despite the increased proximity to the North Platte River, construction effects are still anticipated to be minimal. As with Alternative 1R, significant visual resource construction-related effects would degrade the recreational experience in the analysis area for some visitors under Alternative 2.

Similarly, project operations-related effects on recreation under Alternative 2 also are expected to be similar to those previously identified under Alternative 1R. Long-term access limitations or restrictions to developed recreation sites and dispersed use areas are not anticipated, though project facility-specific locations may be closed to public access for safety and security. New project roads may increase unauthorized access to public lands in the checkerboard portion of the analysis area (though legal public access in this area would still be limited due to private land), thereby increasing some types of unauthorized dispersed use (e.g., hunting, OHV use, fishing). The siting of project facilities also would minimize potential conflicts with the management goals and objectives along the CDNST and North Platte River corridors, because no facilities are within a 1 mile radius of these corridors. Additionally, while the project would significantly change the overall landscape character (as described in Section 4.12, Impacts to Visual Resources), its operation would generally not result in substantial, widespread, or long-term changes to recreational experiences in the analysis area for most visitors.

Similar to Alternative 1R, there would be no significant effects to recreation resources from the construction and operation of the proposed project under Alternative 2.

4.7.4 Impacts to Recreation from Alternative 3, No Miller Hill or Sierra Madre

Under Alternative 3, 1,000 WTGs and associated facilities (e.g., transmission lines, roads) also would be developed in the alternative area on both public and private land, though their placement would be restricted to a smaller area compared to Alternative 1R. As displayed on **Figure 2-5**, the 1,000 WTGs and associated facilities would be concentrated in the Chokecherry portion of the Application Area, as well as the eastern (east of T18N, R88W) portion of the Sierra Madre area. None of the proposed project components would be sited within the western portion of the Sierra Madre and the Miller Hill area to help avoid effects to visual characteristics and wildlife. This also would move project facilities farther away from the CDNST corridor, as well as dispersed hunting areas in the southern portion of the analysis area (near the CRs 503 and 401 intersection), thereby helping to preserve the recreation opportunities and experiences in these areas.

Public access to dispersed recreation occurs on public land blocks south of the Alternative 3 boundary. Similar to Alternative 2, Alternative 3 includes public lands within checkerboard land ownership. There would be no impact to dispersed opportunities or access to dispersed recreation from Alternative 3. While the proposed project would be developed in a smaller total area under Alternative 3 (compared to Alternative 1R), the likely recreation effects would be similar to those already described under Alternative 1R. There may be temporary construction related disturbances (e.g., visible activity, dust, noise) and location-specific public access restrictions, but in general, no significant impacts are expected to recreation sites and use areas and/or recreational experiences in the analysis area, though the recreational experience of some visitors may be degraded due to visual effects of the proposed project. Long-term operation of the project would not result in significant limitations or closures of developed recreation sites and dispersed use areas, nor would it significantly affect recreational experiences in the Alternative 3 area (for most visitors). As noted under the previous alternatives, there may be localized access limitations (for safety and security reasons) at and adjacent to project facilities, as well as some degradation in recreational experiences for some visitors; however, none of these effects are anticipated to be widespread and/or significant.

Similar to Alternative 1R, there would be no significant effects to recreation resources from the construction and operation of the proposed project under Alternative 3.

4.7.5 Impacts to Recreation from Alternative 4, Private Lands Only

Under Alternative 4, the WTGs would be sited only on private lands within the alternative boundary (**Figure 2-6**). Some access roads and electric collector lines would be installed on public lands. The effects to recreation resources on public land would be less than those that would occur under Alternative 1R, as no dispersed activities would be displaced by WTGs. However, the sights and sounds of construction and operation of Alternative 4 facilities on private land would negatively influence the recreation experience of the public on adjacent public lands. The visual impact to viewers on public land, including the effects to the public on the historic Overland Trail and the CDNST, from the construction and operation of facilities on private lands is evaluated in Section 4.12, Impacts to Visual Resources.

During the construction phase of the project under Alternative 4, construction activities may be seen and heard (potentially influencing the recreational experience of some visitors) from some developed recreation sites and dispersed use areas. No access restrictions are anticipated at developed recreation sites in the analysis area, though access to some dispersed use areas may be limited (for safety and project security); and the recreational experience also may be temporarily degraded from construction related traffic, as well as visual changes in the landscape. These effects are anticipated to be temporary and not significantly affect recreation sites, use areas, or experiences in the Alternative 4 area.

During the operations phase of the project, there would be no public access to proposed WTG and other facilities on private lands; therefore there would be no effects to public health and safety. Project components on public lands are not located within the one-mile buffer along the CDNST and North Platte buffers, although sights and sounds of the WTGs would be noticeable from some segments of these areas. The effects to public access to recreation opportunities would be smaller than under Alternative 1R. There is the potential for an increase of unauthorized public access in the checkerboard landownership areas from the development of access roads; however, authorized public access in those areas would continue under the current limited public access. There would be no effect to public access of the public land blocks south of T18N, as no WTGs would be constructed in the block areas. Public access to dispersed recreation uses of these areas would be inconvenienced by road upgrades and installation of collector lines. These impacts would be temporary, and would not be significant. WTGs and other project components sited near the CDNST and North Platte River corridors under Alternative 4 are generally closer than under Alternative 1R would not limit or restrict access to these areas. Finally, the presence of the project is not anticipated to degrade the recreational experience for most visitors to the Application Area.

Similar to Alternative 1R, there would be no significant effects to recreation resources from the construction and operation of the proposed project under Alternative 4.

4.7.6 Mitigation and Mitigation Effectiveness

All action alternatives would incorporate applicant committed measures and best management practices described in Chapter 2.0 of this EIS.

Since recreation impacts from all action alternatives are anticipated to be minor, no other additional mitigation measures are proposed.

4.7.7 Residual Impacts

There would be no residual impacts from the proposed project on recreation use areas from the proposed project under any action alternative. Dispersed recreational uses would continue to be limited for the majority of the Application Area north of T17N due to private land. Where dispersed recreation occurs on public land south of T18N, an increase in heavy truck traffic on public roads would result in a perception of safety hazards or inconvenience, temporarily create noise and fugitive dust, and displace recreation opportunities such as camping and hunting.

Degradation to hunting, fishing, scenic driving, and hiking experiences would occur within and adjacent to the Application Area. Potential residual impact to the recreation experience from unmitigable degradation of visual resources is evaluated in Section 4.12, Impacts to Visual Resources.

4.7.8 Irreversible and Irretrievable Commitment of Resources

Project development sites (e.g., WTG locations, transmission line towers) would be reclaimed upon decommissioning of the project, as such, the commitment of resources is reversible. Additionally, operation of the project is generally compatible with most types of recreation use, especially those currently known to occur in the analysis area (e.g., hunting, OHV-use, fishing). While the quality of some recreation experiences may decline due to degradation of the scenic quality of recreational settings resulting in an irretrievable commitment of resources for the life of the project, there are no irreversible or irretrievable commitments associated with recreation in the Application Area.

4.7.9 Relationship between Local Short-term Uses and Long-term Productivity

There are no project-related short-term uses that would significantly affect the long-term productivity (i.e., ability to provide recreation opportunities) of lands in the Application Area.

4.8 Impacts to Socioeconomics

This section describes and assesses the potential effects of the No Action Alternative, the Applicant Proposed Alternative (Alternative 1R), and other alternatives on socioeconomic conditions and trends in the CCSM analysis area. The expected workforce residency and commuting patterns and the area of expected visibility of the turbines are the two key determinants of the CCSM socioeconomic analysis area. The analysis area encompasses the central and western portion of Carbon County (Saratoga west and including the LSRV) and the eastern portion of Sweetwater County (Wamsutter east).

Key data and information sources used to identify and assess potential socioeconomic effects of Alternative 1R and other alternatives include:

- Carbon County Board of Commissioners and Carbon County Planning Commission (2010), Carbon County Comprehensive Land Use Plan;
- Carbon County, City of Rawlins, and CCSDs #1 and #2 annual budgets;
- IMPLAN Economic Model Data Set for Carbon County – 2006;
- Rawlins Housing Assessment – 2007;
- Wyoming Housing Database Partnership Annual Report – July 2010;
- WDEQ Industrial Siting Division Section 109 Permit Applications for other wind energy projects in Carbon and Albany counties;
- Wyoming Departments of Revenue and Equalization reports;
- Current economic and demographic data from federal and state agencies (e.g., the U.S. Bureaus of Economic Analysis and Labor Statistics, U.S Census Bureau, Wyoming Departments of Employment and Revenue, and BLM/Headwater Economics' socioeconomic profile), illuminated with interviews by local officials and staff;
- Local housing availability and community infrastructure and service capacities, much of which was gained via interviews with local officials, community leaders and other informed citizens; and
- PCW POD.

Table 4.8-1 displays relevant socioeconomic management considerations from the ROD and Approved Rawlins RMP and from the 2010 Carbon County Comprehensive Land Use Plan (Carbon County 2010).

Table 4.8-1 Relevant Management Considerations for Socioeconomics

Management Considerations
BLM RMP and ROD
Management Objectives • Work cooperatively with private and community groups and local government to provide for customary uses consistent with other resource objectives and to sustain or improve local, regional, and national economies. • Maintain and promote the cultural, economic, ecological, and social health within the Application Area.

Table 4.8-1 Relevant Management Considerations for Socioeconomics

Management Goals • Provide opportunities to develop national energy resources on public lands within the Application Area. • Provide opportunities to develop resources other than those related to energy (e.g., grazing, recreation, wildlife, fisheries, and tourism) on public lands within the Application Area. • Provide opportunities to sustain the cultural, social, and economic viability of local and regional communities by using decision review processes that include considerations of various potential impacts of BLM decisions, including housing, employment, population, fiscal impacts, social services, cultural character, and municipal utilities.
Draft Carbon County Comprehensive Land Use Plan
Goals • Achieve a sustainable balance between energy development, agriculture, and the environment. • Protect water supplies of established users. • Sustain scenic areas, wildlife habitat, and other important open spaces. • Retain ranching and agriculture as the preferred land uses in rural areas. • Locate new residential developments and commercial sites in close proximity to municipalities and developed areas. • Ensure that future land development is fiscally responsible and has adequate roads and other infrastructure. • Retain diversity of use on public lands and provide for conversion of public lands to other land uses as would benefit the orderly development of the county.
Relevant Strategies and Actions • Enhance the county government's capacity to monitor, comment on, and influence state and federal decisions on energy development projects. – Conduct regular meetings between Board of County Commissioners, BLM, DEQ, USFS, and other governmental bodies to share information about pending energy projects. – Participate in comment periods for environmental impact statements. • Develop standards for wind energy, transmission lines, and other alternative energy development so they can occur with limited environmental impact on traditional land uses, humans, and wildlife. – Research best practices information for developing standards that encourage alternative energy development and transmission lines with the least environmental impact. – Prepare standards for adoption as part of the County Zoning Resolution. • Support mitigation of impacts created by energy industries where available science supports mitigation. – Maintain dialog with energy industries by regular meetings to keep communication current. – Identify issues that need mitigation and develop solutions for resolution with industry leaders. – If available science indicates a proposed energy project cannot mitigate its impacts, Carbon County should either not approve the project or else recommend that it be located in a more suitable location.

Table 4.8-1 Relevant Management Considerations for Socioeconomics

• Identify open space priorities and recommendations for maintaining these resources. – Develop land use standards that will maintain scenic vistas by the use of innovative subdivision design and clustering. – Support the acquisition of conservation easements on sensitive and unique scenic areas. – Adopt an overlay district for open space, scenic, and wildlife areas. • Maintain recreational use on public lands. – Support multiple use policies, including recreational uses. – Ensure there is adequate access to public lands and rivers by obtaining easements, getting approvals, and purchasing ground to reach public land.

[1] BLM 2008a.

[2] Carbon County 2010.

4.8.1 Issues

Key socioeconomic topics addressed in this section include the following issues raised during scoping for the EIS:

- The EIS should analyze the economic impact of the proposed project, identifying the number and types of jobs, whether local workers will be hired, and what the projected tax revenues for the state and county will be. Encourage utilization of local workforce to meet the project's labor needs.
- How many temporary and long-term jobs would the proposed project generate? What is the expected long-term employment for the wind farm following construction?
- The project will provide long-term jobs and long-term economic advantages for the local economy.
- What is the productive life of wind farms? It is probably longer than 20 years.
- Supports wind energy project because it will generate revenue for the state.
- Social and environmental affects should be assessed for this project similar to the analysis applied to oil and gas leasing and development.
- The proposed project provides little benefit to Carbon County as the power will benefit California, Nevada, and Arizona.
- Will the project have any impacts on local energy costs (e.g., will it help stabilize Carbon County's electrical costs)?
- EIS evaluation should consider the project's potential effects on tourism.
- The EIS should disclose and evaluate environmental justice issues consistent with EO 12898 for impacts to rural low-income communities or potential associated actions for the reasonably foreseeable development analysis.
- The proposed project will be detrimental to the economics of livestock management operations.
- Encourage BLM to work with grazing permittees and agricultural producers to understand the impacts associated with the proposed project. The project will have adverse impacts on grazing permittees, agricultural producers, and landowners both within and near the Application Area.
- The EIS should evaluate the potential conflicts between development and recreational activities.

- Potential loss of public access (for hunting and other recreation), especially on Miller Hill and elsewhere in the Sierra Madre, should be mitigated off-site. For example, recommends additional access to the North Platte River across checkerboard between Pick Bridge and Seminoe Reservoir for sport fishing.
- A socioeconomic program should be developed for this project.
- Question about how the proponent can be a good corporate citizen in Rawlins.
- The Final EIS and ROD should include a thorough analysis of impacts and mitigate the increased costs and reduced revenues for grazing permittees in the Application Area.

In addition to the issues identified during scoping, the following socioeconomic issues were considered during the assessment:

- The assessment of socioeconomic impacts of Alternative 1R will be considered in the context of ongoing and proposed natural gas development, construction and operation of the DKRW Energy, LLC, coal-to-liquids plant in eastern Carbon County, recent expansion of the Wyoming State Penitentiary and other area wind energy and electrical transmission line projects.
- Effects of temporary workforces on local housing conditions, including temporary/short term housing resources, local labor market conditions (e.g., competition with other energy resource development), local population, effects on state and local government revenues, and public infrastructure and service demand.
- Potential effects on residents and other users of land and public access ways within and near the Application Area (e.g., grazing permittees and recreationists).
- Effects of the temporary workforces on social conditions in the study area, particularly in and near Rawlins.
- Potential effects on local attitudes, opinions and lifestyles.

4.8.2 Methods for Analysis

Methods used in the assessment of potential socioeconomic effects of the Alternative 1R and other alternatives include:

- Review of the PCW POD to determine the proposed timetable for project construction, construction and operations labor force and expenditure estimates for the WTGs, transmission lines, and electrical substations, to support the economic impact modeling.
- Quantitative descriptors for Alternative 1R were used to estimate the short- and long-term economic effects (jobs and income).
- Economic data from a version of the IMPLAN economic model are used to assess indirect and induced employment and income effects of the project, with emphasis on the construction period.
- The employment effects provide the basis for assessing the project's implications on community, population, housing, facilities and services, public education, and social conditions in the region.
- Major state and local revenues (e.g., ad valorem taxes during operations) associated with the capital investment and labor force income for each alternative were estimated using an Excel spreadsheet based model.
- A qualitative assessment of the effects of Alternative 1R and other alternatives on local fiscal conditions was conducted, based on the changes in demands on services, staffing requirements, and other key expenditure functions.

- Potential effects on local social conditions were assessed, focusing on other users of the study area. The assessment was based on scoping comments, articles and editorials in local news media, interviews with local officials and staff and other sources as cited.
- The CCSM EIS land use, recreation and visual analyses were reviewed to identify potential non-use and non-market value effects. Potential non-use and non-market value effects were assessed qualitatively.
- Information on low income and minority populations within the analysis area was reviewed to identify potential environmental justice populations. Environmental and health effects of Alternative 1R and other alternatives was reviewed to determine whether disproportionately high environmental and health impacts would accrue to identified minority or low income populations.

4.8.2.1 Assumptions

The following assumptions were used for the socioeconomic assessment:

- Estimated direct employment, capital investment and schedule information provided by PCW are relied on to assess the economic, demographic, community service, fiscal and social consequences of Alternative 1R and other alternatives.
- Direct construction employment estimates will be based on those presented in the POD.
- Project development costs, disaggregated into major subcategories, e.g., labor, materials, equipment, construction management, will be provided by the project proponent.
- Workforce access and material and equipment deliveries into the Chokecherry and Sierra Madre Application Areas will use the routes identified in PCW's PTMP (PCW 2010a).
- PCW, as part of its Wyoming Industrial Siting Permit application for the CCSM, will develop a housing plan to accommodate its construction workforce and identify specific local government service impacts associated with anticipated construction workforce. Affected local governments will have the opportunity to participate in the Industrial Siting Permit process.
- Detailed estimates of the project development costs are not presently available. For the purposes o estimating selected future public sector revenues associated with the project, costs are assumed to be on the order of $4.2 to $6.2 billion.

The following criteria were used to determine whether socioeconomic impacts of the Alternative 1R and other alternatives would be significant:

- An increase in county or community temporary or resident populations that would unduly strain the ability of affected communities to provide housing and services or otherwise adapt to growth-related social and economic changes;
- An aggregate change in public sector revenue and expenditure flows likely to result in an inability on the part of affected units of government to maintain public services and facilities at established service levels;
- Permanent displacement of residents or users of affected areas that would result from project-induced changes in or conflicts with existing uses or ways of life;
- Disproportionately high and adverse environmental or human health effects to an identified minority or low-income population, which appreciably exceed those to the general population around the Application Area.

4.8.2.2 No Action Alternative

Under the No Action Alternative, the CCSM project would not be built as proposed. Management of public lands in the Application Area would continue to be guided by the Rawlins RMP. The private lands included in the proposed project would be available for continued agricultural use, as well as for other potential land uses that are consistent with the owner's preferences, resources, real estate market realities, and local land use regulations.

No Action, however, does not mean no change in future conditions. Long-term population forecasts prepared by the Wyoming Department of Administration and Information and reflecting general economic and demographic trends across the state and in Carbon County anticipate modest growth through 2020, followed by extended slow decline in resident population through 2030. Superimposed on those general trends would be short-term and cyclical changes in economic and social conditions associated with previously approved, but not yet implemented, natural gas and other natural resource development on public lands, similar development on private lands, and a myriad of other ongoing events, influences, and actions that are unrelated to this project. The growth and decline would be accompanied by other changes in economic, demographic, and social conditions.

4.8.3 Alternative 1R, Applicant Proposed Alternative

4.8.3.1 Local Economic Effects

<u>Employment and Temporary Labor Force Immigration</u>

Construction, operation, decommissioning and reclamation of the facilities associated with Alternative 1R, as described in Chapter 2.0 of this EIS, would represent a significant capital investment (on the order of $4.2 to $6.2 billion, depending on the model/capacity of WTG selected) resulting in the employment of a substantial workforce, deployment of a large fleet of construction equipment, and a commitment of materials, supplies and equipment. Critical parameters affecting the potential social and economic impacts associated with the applicants proposed alternative include the numbers of construction and operations workers, timing and duration of their employment, residency patterns of those nonlocal workers[1] who temporarily relocate to Rawlins and other communities in south-central Wyoming, and the availability of temporary housing (motels, RV parks, apartments, and single family rentals).

As summarized in Section 2.2, General Project Description, the proposed project would consist of two wind farm sites located south of Rawlins, on which a total of 1,000 WTGs (2,000 to 3,000 MW combined capacity) would be erected, along with ancillary facilities and an internal road network to support development and maintenance. Construction of the project is scheduled over 4 years,[2] with the active period construction concentrated during the months of April through October when weather conditions are most favorable. The specific locations and timing of construction activity would take into consideration seasonal wildlife avoidance areas, with the general schedule and location as follows:

- **Year 1:** construction of an off-site IRF (not part of the proposed project), operation and maintenance facility, primary internal haul roads within both the Chokecherry and Sierra Madre sites, staging areas and batch plant in both sites, water extraction site and main transmission line road and towers. Interim reclamation of disturbed areas begins.

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[1] Note: For this assessment, a locally hired worker is one that commutes daily from his or her place of residence at time of hire, regardless of where that place of residence may be located. Residents of Carbon County, with some from the Town of Wamsutter in Sweetwater County, would likely account for most of the locally hired workers.

[2] PCW's POD calls for interim reclamation, employing a small number of workers, to continue for several years following the completion of construction.

- **Year 2:** WTG sites would be prepared and turbines completed in the western portion of the Sierra Madre site and turbine pads developed in the northern portion of the Chokecherry site. Additional ancillary construction support roads and facilities and electrical facilities also would be completed. Initial transmission line stringing would be completed, allowing completed WTGs to be commissioned and begin production. Interim reclamation of disturbed areas continues.
- **Year 3:** turbines in the western portion of the Chokecherry site would be completed and turbine pads in the eastern portion of the Chokecherry site would be constructed, along with additional construction support roads and facilities and electrical facilities. Transmission line stringing also would be completed, facilitating full production as WTGs are completed and commissioned. Interim reclamation of disturbed areas continues.
- **Year 4:** turbines in the eastern portions of both sites would be completed, along with additional ancillary facilities. Following the completion of construction and commissioning activities, interim reclamation of disturbed sites continues.

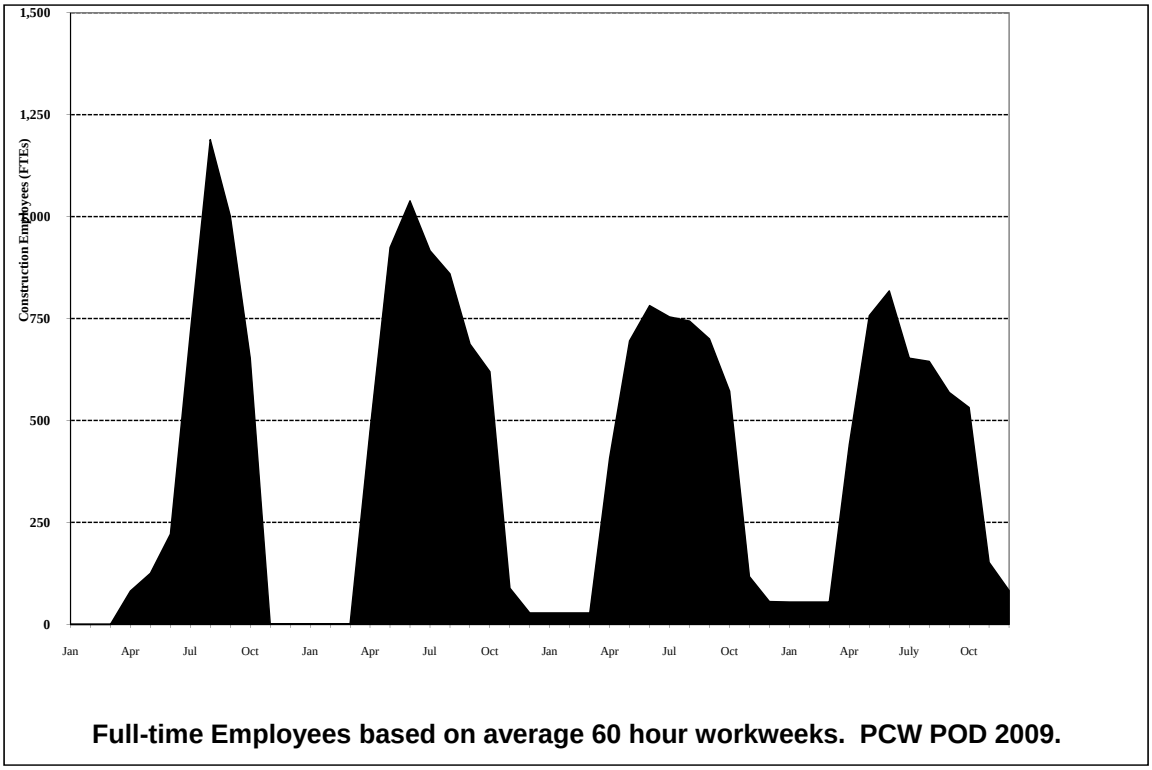
A 6-day workweek, with 10-hour shifts, is envisioned in order to achieve the desired construction schedule. During the first year, two shifts of construction activity are planned.

Temporary construction employment, based on the preliminary engineering and conceptual layouts for the project is projected to peak at 1,189 during the first year, not including employment associated off-site access improvements. The timing of those improvements is not outlined in the POD, but could reasonably be expected to occur prior to or in conjunction with the on-site improvements. In Years 2, 3, and 4 of construction, construction employment is projected to reach 1,039, 782 and 818, respectively. These estimates do not include employment estimates associated with off-site access improvements. Considerations for weather and seasonal wildlife avoidance result in a seasonal employment profile characterized by a rapid ramp up in the spring, several months of high employment, and then a sharp drop-off in the fall (**Figure 4.8-1**).

Accounting for the variation in employment over time provides slightly different perspective on the project's construction manpower needs. Average employment for the two peak months in Year 1 (August and September) and 4 months (May to August) in years 2, 3, and 4 would be 1,096, 935, 744, and 718, respectively. The peak workforce requirements in Year 1 establishes the basis for identifying and assessing many of the socioeconomic effects of the project within the local region, particularly those related to housing, transportation, and some service demands. Not only is the scale of many of the effects anticipated to decline over time, but local preparation and planning efforts for each subsequent year of construction activity would benefit from the experience and insights gained by PCW, its contractors, local public entities, local businesses and the community-at-large during the preceding years.

The combination of the extended workweek and 10-hour shifts has an important bearing on the socioeconomic assessment as it results in direct construction manpower estimates up to 25 percent lower than results in conjunction with 45- to 50-hour workweeks, which characterize many non-construction jobs. By extension, the reduction in workforce results in lower levels of immigration, population influx and perhaps most critically, lower demand for temporary housing.

As WTGs are commissioned, staffing for ongoing operations and maintenance would commence. At full operations, up to 114 full-time employees would be required to operate and maintain the project throughout its operational life. On-site staff would be supported by employees of turbine and other equipment manufacturers, contractors, and vendors providing specialized support services.



Full-time Employees based on average 60 hour workweeks. PCW POD 2009.

Figure 4.8-1 Projected Construction Employment (full-time employees) for the CCSM Project, Years 1 through 4

In addition to the CCSM direct construction and operations and maintenance workers, the economic infusion associated with project construction would support secondary jobs to service the CCSM project and construction workforce. The secondary employment supported by the project would consist of the following:

- Indirect employment includes jobs supported by PCW and contractor purchases of goods and services from local and regional businesses. It is assumed that all major purchases of equipment, materials, and supplies would be made elsewhere and the commodities delivered to the area via truck or rail.
- Induced employment includes jobs created by employee spending of CCSM-related earnings and public sector revenues thereby generated, and by business, local government and school district spending in response to increased demand. Induced employment will occur across a number of economic sectors including lodging, and food and beverage, fuel and convenience retail, and motor vehicle sales and service establishments.

Existing business establishments in Rawlins and surrounding communities would realize much, if not most of the secondary benefits supported by the project. The increase in business revenues may allow some business to expand, as well as supporting new business development. Local government and other public entities also may experience increases in activity and staffing in conjunction with the project.

The relationship between direct and secondary jobs is typically expressed in terms of a “multiplier”, where the multiplier can be expressed in terms of the total jobs supported per direct job, or in terms of the incremental jobs supported. For example, a total jobs multiplier of 1.8 indicates a net change of

1.8 jobs for each direct job created; the direct job plus an average of 0.8 indirect and induced jobs. The same relationship can be expressed as a secondary multiplier of 0.8 jobs, which reflects only the indirect and induced response; Multipliers are specific to a defined geographic or economic region and to an industry. Thus, for example, the multipliers for construction differ from those for transportation, and those for Carbon County would differ from those for Teton County. The differences in multiplier reflect differences in the underlying economic structure of the reference region and the intraregional supply and demand linkages between industries. The expected ability for the project to draw labor from the local labor pool also factors into the "multiplier" relationship because local labor typically spends a larger portion of their income in the local community than do temporary non-local workers who forward substantial portions of the earnings back to their permanent place of residence. The secondary jobs multipliers for this assessment, based on economic data for Carbon County and the above factors, are 0.5 for direct construction jobs and 0.8 for long-term O&M jobs. The higher multiplier for the O&M jobs reflects a combination of year-round residency for most of these workers and local business spending in conjunction with the project. Applying these multipliers to the multi-month average direct employment estimates yields total estimated temporary employment impacts of 1,644 jobs in the study area in Year 1 of project construction (**Table 4.8-2**). Construction-related employment impacts are lower in the subsequent years.

Table 4.8-2 Total Project-related Employment, CCSM Project, Alternative 1R

	Year 1	Year 2	Year 3	Year 4	Full Operations
Project Direct (Average)[1]	1,096	935	782	794	114 to 158[3]
Indirect & Induced[2]	548	468	402	421	91 to 126
Total	**1,644**	**1,403**	**1,184**	**1,215**	**205 to 284**

[1] Includes both construction and operations staff.

[2] Based on secondary jobs multipliers of 0.5 for construction and 0.8 for operations.

[3] Low end of the range is reported in the PCW POD and appears to reflect 6-day, 10 hour/day workweeks. The high end of the range, reflecting 40 hour workweeks, was derived by AECOM.

Local sectors that would likely experience the largest boost from demands associated with the CCSM project include the hospitality industry (lodging, dining and drinking establishments), grocery and liquor stores, convenience food and gas, other automotive service establishments, and health care and personal services. Based on the proposed transportation access to the site, location of the IRF, and availability of temporary housing, the majority of the indirect and induced jobs in the region would likely be located in Rawlins. Other nearby communities, notably Wamsutter and Saratoga, would see increases in local jobs, based on the residency of workers.

Operations and maintenance staffing would begin as WTGs are commissioned, increasing over time until reaching full employment estimated at between 114 and 158 employees. Hiring of the permanent staff, as well as related corporate purchase would support an estimated 91 to 126 additional indirect and induced employment in the region. The O&M and related secondary jobs would continue over the 25+ year expected life of the project, constituting a long-term social and economic benefit of the project to the community.

The commissioning of WTGs and transition to operations could trigger new residential construction, particularly in the Rawlins area, as project staff and others seek to buy or rent conventional housing. The timing and extent of such construction would reflect the level of non-local staffing, availability of suitable housing in the market, and building cost and financing conditions at the time. New residential construction could result in an additional, short-term, influx of nonlocal workers. That influx could occur in the latter stages of construction and early years of operations. While the residential construction activity

could be sensitive to weather-related fluctuation, some level of construction activity could occur year-round.

Large-scale construction projects such as the CCSM represent a substantial economic infusion into local economies, creating potential job opportunities for residents. In some instances, the infusion provides support to sustain existing jobs, in others it supports creation of new jobs. Local hiring to meet project needs also depends on underlying labor market conditions; stable and growing economies characterized by low under- and unemployment offers less opportunity for local hiring than do markets characterized by higher unemployment. At the same time, many of the direct jobs associated with construction of the CCSM project require specialized skills that are not readily available in sufficient numbers from within the resident labor force, thereby resulting in an influx of workers. Of necessity, wind energy projects typically employ specialized subcontractors who bring in most of their managerial and skilled laborers from their base of operations. The level of immigration is a principal determinant of housing needs and temporary population influx that creates additional demands on local facilities and services.

The projected level of immigration for the CCSM project is based on the total employment needs outlined in **Table 4.8-2**, less an allowance for local hiring. For this assessment, local labor is projected to meet 400 jobs in Year 1, 325 jobs in Years 2 through 4, and 86 of the long-term jobs. These forecasts reflect local labor market conditions, the seasonal augmentation of labor force by high school and college students during the summer, and the job requirements of the project. Reductions in the pace of oil and gas development and general economic weakness associated with the global economic recession had driven local unemployment above 9 percent and 700 individuals at the end of 2009. Unemployment has since declined, though still above 500. Year 1 of construction also would offer many jobs for truck drivers, general laborers, and other occupations that are represented in the local labor force. The resulting needs to fill jobs from outside the local labor pool range from 1,244 (Year 1) to 859 (Year 3) (**Table 4.8-3**). At full operations, implementation of the CCSM project under Alternative 1R would result in as many as 119 additional workers in the local economy.

Table 4.8-3 Projected Local Hiring and Migration to Fill Jobs Supported by Alternative 1R

	Year 1	Year 2	Year 3	Year 4	Full Operations
Total Incremental Jobs	**1,644**	**1,403**	**1,184**	**1,215**	**205 to 284**
Jobs Filled by Residents and Local Commuters[1]	400	325	325	325	86
Jobs Filled by Workers Relocating to the Area	1,244	1,078	859	889	119 to 198

[1] Based on availability and seasonal expansion of the local labor force, local hires are expected to fill between 24 percent and 28 percent of the total project-related jobs.

Local labor force availability for the CCSM would be sensitive to competing demands from other projects, particularly those associated with oil and gas development. Such competition could constrain local labor availability, increase the level of immigration, but also limit the indirect and induced response should business and public sector employers are unable to fill positions due to insufficient availability of labor. Over time such conditions provide incentives for more residents to join the labor pool, however, the seasonal nature of these needs may limit such an effect, particularly in Year 1. In such instances, some employees and proprietors also “benefit” from additional hours of work, including overtime. Experience gained during Year 1 with respect to the demand for goods and services associated with the temporary workforce may benefit firms to better anticipate and respond to the seasonal needs in Years 2 through 4.

The project would result in a higher degree of seasonality in the local community than occurs with tourism or hunting. From a community perspective, the seasonal nature of the anticipated construction of

the CCSM project would result in dramatic, twice a year changes in the level of activity, business sales, staffing needs, and hours of operation; in the spring when activity ramps up and again in the fall when activity declines sharply. The effects of a sudden influx and then exodus of workers would be similar to what occurs in conjunction with University of Wyoming students, staff, and faculty in Laramie. There is, however, an important difference, that being the recurring certainty of the schedule for the University. Advanced communications to the Rawlins community regarding an anticipated startup of activity would help reduce the impacts. End of season changes, however, are subject to the influences of weather, and therefore uncertain.

The seasonal influence of the CCSM would be diminished during operations, although some additional activity could occur during the summer in conjunction with routine maintenance activities supported by contractors and vendors.

The bulk of the decommissioning and final reclamation would occur over a 3 year period, generating additional short-term direct, indirect and induced employment opportunities in the area. Decommissioning activities would occur from April through October due to seasonal wildlife avoidance and weather. Direct manpower requirements for decommissioning are estimated at 300 to 400 jobs, substantially less than required for project development. Future labor market conditions and the availability of qualified labor cannot be foreseen at this time, but local workers would be expected to fill some of the available jobs. The remaining jobs would be filled by temporary workforce immigration. Given the scale of the overall needs, the level of immigration would be much smaller than that associated with project construction.

Personal Income

Implementation of Alternative 1R would result in beneficial short-term and long-term increases in personal incomes in the region. Jobs in the construction industries are among the highest paying jobs in the local economy, thereby contributing to enhanced economic welfare for the directly affected households. The short-term direct increases, consisting of wages, salaries and the value of benefits paid to construction workers are estimated at approximately $140 to$145 million over the 4-year period; a portion of which would accrue to local residents. Although much of the income accruing to non-residents would leave the region, the local economy would benefit from local purchases of goods and services made by non-local workers during their time of local tenancy. Proprietor and employee earnings associated with the indirect and induced jobs supported by the construction phase of the project would contribute an estimated $25 to $30 million over the 4-year project, resulting in a net increase of $165 to $175 million in earnings. The increases in wage and salary earnings would drive some short and long-term increases in non-earned income, resulting in additional income for residents.

Long-term gains in direct labor income associated with operations of Alternative 1R are estimated at $8.7 to $10.3 million per year, at full staffing levels. Annual income supported by the indirect and induced jobs would add approximately $1.7 to $2.1 million, yielding a net total of between $10.2 and $12.5 million annually; equivalent to nearly two percent of the total personal income of Carbon County residents in 2008.

The incremental income from operations would continue over the life of the project. Decommissioning and final reclamation would generate additional short-term income in the future.

Indirect Effects on Other Economic Sectors

Implementation of Alternative 1R might result in indirect effects on grazing, outdoor recreation, including hunting, general tourism, and other activities that contribute to the local economy. The effects on grazing would stem from short-term and long-term reductions in authorized grazing levels and from traffic and construction activities which could render some pastures temporarily unusable (Section 4.6, Impacts to Range). The losses would adversely affect a number of permittees, including TOTCO. Loss of AUMs for most operators except TOTCO would be minimal. The incremental loss of total AUMs would be small

within the context of the overall RFO and effects on TOTCO have likely been considered in the lease agreement between TOTCO and PCW. Other operators would not receive any offsetting economic benefits associated with the wind farm development. For these, the net effect would be adverse, the consequence depending on the availability of alternative grazing/feed. For most other operators, the loss of AUMs would be minor, short term and temporary. Loss of the use of pastures as a result of traffic and construction activities could represent a more substantial effect on individual operators, but these effects would be temporary and short term, likely occurring during one grazing season.

Access into the proposed Application Areas for dispersed recreation is limited because the proposed project would be located almost entirely within the existing TOTCO boundary. Consequently, CCSM construction activities are not anticipated to preclude existing recreation activities and/or limit public access to recreational opportunities (Section 4.7, Impacts to Recreation). However, the substantial change in the recreation setting that would occur during construction could result in a relocation of some recreation uses to other parts of the RFO. At the same time, hunting and fishing could increase in the region due to the presence of more workers in the community. During the first two years of construction, high volumes of truck traffic would result in congestion and delay on WY 71 /CCR 401, which provides access to the western portion of the Medicine Bow National Forest. Congestion would occur primarily at the point where the internal haul road crosses WY 71/CCR 401, but could occur throughout the northern portion of the route during shift changes if the WY 71/CCR 401 workforce commuting option was selected. The resulting delay could encourage travelers to the Medicine Bow National Forest to seek other routes or choose other recreation resources outside of Carbon County. These effects would likely be short term and temporary, occurring during the summer of the first two years of construction.

The net effect of CCSM construction on the Carbon County tourism and recreation economy is unclear. As noted above, recreationists displaced by construction activity may choose to recreate elsewhere in the county or RFO, although opportunities for recreating in undeveloped areas are becoming more limited given the increasing level of energy development in the County and RFO.

Potential long-term effects on tourism also are unclear. As reported in Section 3.8, Socioeconomics, the Rawlins area has garnered favorable media coverage for its outdoor environment and recreation, which attracts an unknown level of tourism visitation. However, most tourism in the Rawlins area is comprised of travelers on I-80. In the short-term, outdoor recreation and tourism may both be sensitive to construction activity at the project, particularly in terms of competition for overnight lodging. Long-term outdoor recreation may be somewhat sensitive to the visual and land use effects of the project. Overall, the net effects of construction in economic terms are likely to be limited as the economic benefits of construction would offset or exceed the adverse effects. It is likely that the adverse economic effects would accrue to those individual businesses or sectors of the economy that rely specifically on tourism and outdoor recreation, while the benefits would accrue more broadly, to sectors that provide goods and services to construction workers as well as visitors.

4.8.3.2 Local Population and Demographic Effects

Immigration by workers to fill the temporary and long-term manpower requirements of the CCSM under Alternative 1R would translate into short and long-term population increase in the region. The majority of the nonlocal construction workers would be single-status, that is, unaccompanied by one or more other individuals. Most of those that are not single-status would likely be accompanied by another adult, most of whom would fill a job supported directly or indirectly by the project. The transition to operations, which would begin as WTGs are commissioned in Year 2, would be accompanied by changes in demographic effects. Unlike the temporary construction workers, these residents would be year-round and their demographic characteristics, for instance, marital status, size of household and presence of children in the household, would generally mirror those of the local community.

The projected seasonal population impacts associated with the CCSM project, allowing for local hires, the combinations of construction and operations jobs in Years 3 and 4, and differences in demographic

characteristics to fill direct and secondary jobs supported by the CCSM project, would peak at 1,363 residents Year 1, declining to 936 in Year 3 (**Table 4.8-4**). Completion of CCSM project construction would result in a substantial decline in temporary population and long-term population growth of between 253 and 424 residents at full operations, depending on operational staffing levels. The long-term population growth due to the project would represent an increase of between 1.6 and 2.7 percent of Carbon County's current population. Most of the new residents would likely reside in Rawlins. The growth in resident population and the corresponding economic infusion it represents would generally be welcome in the community.

Table 4.8-4 Project-related Population Impacts, CCSM Application Area, Alternative 1R

	Year 1	Year 2	Year 3	Year 4	Full Operations
Workers Immigrating to the Area	1,244	1,078	859	889	119 to 198
Estimated population influx associated with the CCSM[1]	1,363	1,199	936	1,008	253 to 424

[1] Based on assumptions regarding percentages of average employment, single status vs. accompanied workers, persons per accompanied worker, and mix of construction and operations workers in Years 3 and 4.

Recent construction experience indicates that few school age children would be among the temporary migrants as most workers would be single status. For example, the second quarter 2010 Wyoming Industrial Siting Division monitoring report for the Dunlap Wind Energy Project, located in eastern Carbon County, had a peak of 227 workers and only one new student enrolled in local schools (RES/Pacific Corp 2010). Moreover, the seasonal nature of the CCSM construction period from April through October with workforce peaks during summer months would discourage workers with school age children from relocating them to the Rawlins area. Over time, local school districts could see enrollments climb by 30 to 70 additional students in conjunction with the CCSM project.

4.8.3.3 Housing Needs

Construction-related housing demand associated with Alternative 1R would be created by the non-local construction workforce and by the non-local indirect and induced workforce who would provide goods and services to the project and to the construction workforce. Construction-related housing demand would occur during the April through November period of each of the four construction years, and is likely to be satisfied primarily by temporary housing units (hotel/motel rooms and RV pads), although temporary workers would certainly use rental housing, apartments and mobile homes if available for short term occupancy.

Assessing housing effects of the construction phase of the CCSM project presents a number of challenges. Chief among these is the potential for other construction and natural resources development activities to compete with CCSM construction workers for housing resources in communities near the project site (Section 5.8, Socioeconomics). Workers associated with previously approved projects, such as the Atlantic Rim, Seminoe Road, Desolation Flats and South Baggs Area natural gas development projects and authorized interim drilling associated with the Continental Divide - Creston Natural Gas Development Project typically seek temporary housing in the same communities as would workers on the CCSM project. An inventory of available temporary housing in the region was conducted during the summer of 2010 for this assessment. At that time, natural gas drilling activity was at a fraction of 2004 to 2008 levels and associated natural gas development housing demand was correspondingly low, so much so that several temporary worker housing facilities near Wamsutter and Dad were closed. Increases in natural gas sales prices could result in a resurgence of natural gas development activity

with associated elevated employment levels for these previously approved projects, increasing competition for temporary housing resources in Rawlins and nearby communities.

Additionally, commercial, public infrastructure and highway construction projects within the CCSM analysis area typically occur in summer months and the workforce associated with these projects would similarly compete for housing resources. For instance, during the summers of 2009 and 2010, several I-80 highway and overpass reconstruction projects, a number of public infrastructure projects, and construction of a consolidated elementary school in Rawlins were all underway. These projects absorbed an unknown but likely considerable amount of temporary housing during that period.

Consequently, the summer of 2010 was not atypical for temporary housing demand in communities near the CCSM project, but temporary housing availability at the time CCSM would begin construction could be greater or less than that period, depending on natural gas development and infrastructure construction levels.

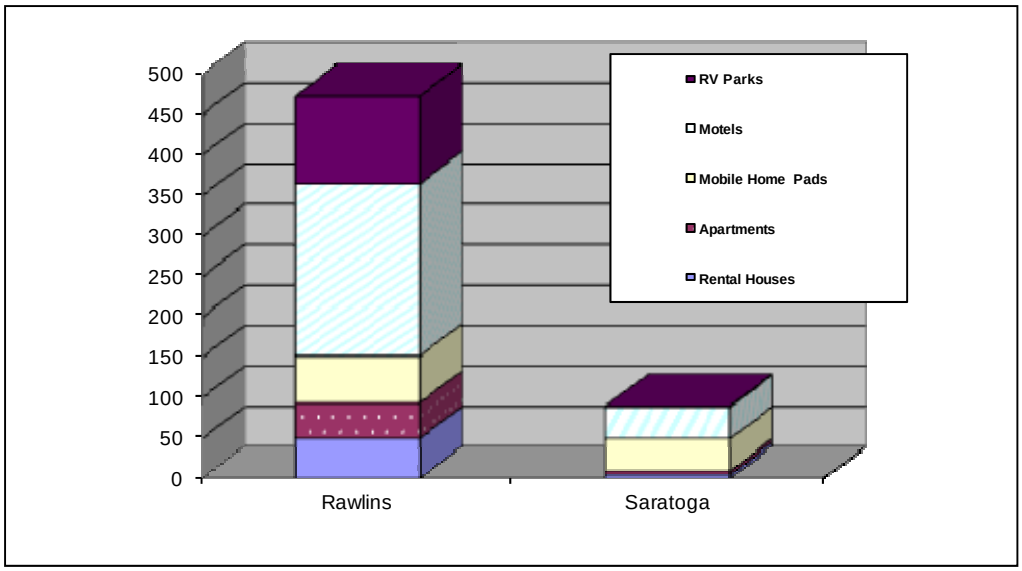
Housing availability estimates contained in this assessment are useful for assessing the general potential for communities to accommodate CCSM housing demand, but due to the factors listed above, are subject to relatively rapid change. The CCSM project would need to provide a detailed assessment of housing availability for the required Wyoming Industrial Siting Permit Application, and provide a plan for accommodating non-local construction workers. That assessment would occur closer in time to the beginning of construction and would presumably be able to account for housing availability conditions at that time.

For this assessment, housing availability was assessed during August 2010, using currently published data augmented by telephone interviews with realtors, landlords and staff of the CCVC. For conventional rental housing (single and multifamily homes and apartments), the most current data on availability/vacancy is the Wyoming Housing Database Partnership's (WHDP)Semiannual Rental Vacancy Estimates for the second half of 2009. That survey represented rental housing managers who controlled 658 units, identifying a total of 105 vacancies, for a vacancy rate of 16 percent. The corresponding information for the first half of 2009 was a 22 percent vacancy rate; 124 vacant units out of a sample of 562 units. Interviews with realtors and apartment managers indicated fewer vacancies during the summer of 2010 due to seasonal increases in natural gas development and the infrastructure construction projects underway.

The CCVC conducted an informal motel and RV park occupancy survey in August of 2010. Based on that survey, the CCVC reported that newer motels in Rawlins affiliated with national chains averaged 95 to 98 percent occupancy, while older motels, which are more likely to accommodate construction and gas field workers on a weekly or monthly basis, averaged 75 to 80 percent occupancy. The RV parks in Rawlins reported average occupancy of 80 to 85 percent. Motels in Saratoga averaged 75 to 80 percent occupancy and the RV parks averaged 95 to 100 percent occupancy (CCVC 2010). The midpoints of each range of occupancy rates provide the basis for estimating availability to meet project-related needs.

Based on the above information, the assessment assumes that 50 rental homes within Carbon County would be available during CCSM construction and 10 percent of the apartments in Rawlins, or 44 units would be available. Based on the 2010 housing inventory, the assessment assumes that 58 mobile home pads in Rawlins and 40 mobile home pads in Saratoga would be available. The assessment includes no availability of motel or RV park space in Baggs or Dixon, because temporary housing was reported to be fully occupied by ongoing natural gas drilling activity near those communities (Howell 2010). Natural gas development, although at recent low levels during summer of 2010, is likely to continue through the CCSM construction period. Similarly, no motel availability and only five RV spaces were assumed to be available in Wamsutter, again because of ongoing natural gas drilling in the area (Colson 2010). It is possible that some CCSM construction workers would secure housing in these communities, but the numbers of such construction workers would likely be small.

Finally, the assessment includes no temporary housing availability for Elk Mountain, Hanna or Medicine Bow, because of the limited housing resources available and likely competitive demand from ongoing and future wind energy facility maintenance and construction near those communities. No availability was assumed for Encampment or Riverside because of the limited temporary housing resources and the tourism and recreation nature of the temporary housing resource base in those communities. As with Baggs, Dixon and Wamsutter, some CCSM construction workers may secure housing in these communities, but the numbers of such workers would likely be small. Consequently, Rawlins and Saratoga were the only communities within the study area with a substantial temporary housing base and summertime availability during the summer of 2010 and, under current circumstances, the only communities likely to host substantial numbers of CCSM construction workers. **Figure 4.8-2** displays housing supply in Rawlins and Saratoga as of August 2010.



Source: Carbon County Visitors Council 2010.

Figure 4.8-2 Rawlins and Saratoga Housing Availability: August 2010

Table 4.8-5 displays estimated construction-related housing demand for the 4 Year CCSM construction phase contrasted with estimated available housing supply during the summer of 2010. For the demand analysis, employment was averaged during the peak months of each construction season (two months in Year 1, four months in Years 2 – 4), and the averaged demand was increased by 15 percent to allow for temporary construction peaks and labor market friction[3]. The housing demand estimates also reflect a ratio of 1.25 workers per housing unit across all types to reflect workers who would share accommodations and the portion of the indirect and induced jobs that would be filled by household members accompanying workers in direct, indirect and induced categories.

As shown in **Table 4.8-5**, estimated housing demand in affected communities would exceed summer 2010 supply by 581 units during the peak months of the first year of construction. Although few

[3] The term "labor market friction" refers to situations in which some job seekers arrive in a community but are unsuccessful in securing employment, newly hired workers arrive in advance of the actual beginning of their employment, or temporary delays in progress due to weather or other unforeseen events that result in additional temporary housing demand.

Table 4.8-5 CCSM Housing Demand, Supply, and Net Housing Balance

Total Housing Demand	Workers per Unit	Year 1	Year 2	Year 3	Year 4
Direct Hires	1.25	677	608	486	495
Indirect	1.25	318	254	202	216
Allowance for Peak and Friction	15%	149	129	103	107
Total		**1,144**	**991**	**791**	**818**
Demand Preference by Type of Unit					
Motel	65%	744	644	514	531
RV Space	15%	172	149	119	123
Apartment	10%	114	99	79	82
Conv. Single Family	10%	114	99	79	82
Total		**1,144**	**991**	**791**	**818**
Available Housing Supply					
Motel		252	252	252	252
RV Spaces/Mobile Home Pads		207	207	207	207
Apartment		49	49	49	49
Conv. Single Family		55	55	55	55
Total		**563**	**563**	**563**	**563**
Housing (Shortfall) or Surplus					
Net Housing Balance		**(581)**	**(526)**	**(228)**	**(255)**

construction workers are likely to move a mobile home to the Application Area for a matter of months each construction season, it is possible that contractors or subcontractors may choose to do so to house workers. It also is likely that indirect and induced workers would use mobile home spaces. The housing shortfall would decrease to 526 units in the second year of construction, assuming similar availability. During the final two years of construction, the shortfall would decrease to an estimated 228 and 255 units, respectively.

PCW would be required to address the shortfall in local housing accommodations in its Wyoming Industrial Siting Permit Application. Several options would be available to the company at that time.

One option would be to secure commitments from local motel and RV park proprietors to accommodate a larger share of the construction workforce than has been assumed for this assessment. While it is likely that some motel and RV proprietors would provide commitments for additional rooms, demand from other sources such as natural gas development, highway construction, and I-80 travelers could be unsatisfied. Under such conditions, some natural gas development and highway and infrastructure construction workers (and possibly CCSM construction workers) would likely seek unconventional accommodations, such as workers sharing rental accommodations or parking RV's in residential or commercial areas, as happened in Rawlins during another recent industrial construction project. Workers

using these resources have caused disruption in residential neighborhoods and increased demand for code and law enforcement services (Golnar 2010b; Massey 2010; Reed 2010). There also is concern among some BLM and USFS officials that natural gas and construction workers unable to find accommodations might camp on public lands reducing campground availability for public land visitors.

PCW also could seek to secure temporary housing commitments in more distant communities such as Laramie or Rock Springs. Securing housing commitments in these communities could allow a more moderate and constant level of construction worker housing demand within communities near the Application Area, which would provide income for lodging proprietors and other local businesses and reduce the level of local government service demand during peak construction months. However, there is considerable local skepticism that construction workers would choose to add a 3 hour daily round-trip commute to ten hour workdays and six day workweeks, even if PCW were to provide busing to and from these more distant communities. If a substantial number of workers chose not to be housed in these more distant communities and make the three-hour daily commute during peak construction months, they would likely seek housing in communities near the Application Area, resulting in conditions similar to those described in the previous paragraph.

Another construction worker housing option would be the installation of a Temporary Housing Facility (THF) within or near the project site. The THF could be sized to accommodate all or a portion of the non-local construction workforce, depending on PCW housing strategies. If the THF was sized to accommodate only a portion of the peak non local workforce, local businesses could still profit from construction worker spending for lodging, dining and entertainment. Depending on THF amenities and management policies, social issues associated with the large temporary and transient construction workforce and related local government service demand in nearby communities also could be reduced.

Other options for housing the temporary workforce may be possible such as cooperation with local governments, nonprofit housing organizations, other development projects or private developers to develop housing that could be used for the CCSM construction workforce and later serve other public or private housing purposes.

Housing demand during project operations would be associated with households supported by the 114 to 158 direct staff and up to 126 indirect and induced jobs in businesses and local government, schools, etc. who would provide goods and services to the project and project employees. At full operations a need for between 109 and 182 units is projected in conjunction with new households in the community. Given the scale of the demand compared to total housing stock (Section 3.8.5, Housing), the Rawlins and Saratoga housing markets would be able to supply sufficient conventional housing units to accommodate CCSM operations-related demand, although all workers may not be able to secure the desired housing at the desired price immediately. Demand for conventional housing is likely to increase housing costs and stimulate some new residential construction in one or more existing or new subdivisions in Rawlins.

Because all operations employees are anticipated to report for work at the onsite O&M facility, they would likely seek conventional housing resources such as single and multifamily homes and mobile homes with a reasonable daily commuting distance of the Application Area, primarily Rawlins, Sinclair or Saratoga. Commuting over county roads from Baggs and Dixon during winter months is difficult and at times impossible.

Decommissioning and final reclamation-related housing demand would be associated with the estimated 370 workers required for decommissioning/reclamation activities and the indirect and induced employees required to provide goods and services to the decommissioning/reclamation project and project employees. Most decommissioning/reclamation workers would require temporary housing. Because decommissioning/ reclamation activities would occur more than 30 years in the future, it is not possible to forecast how many workers might be drawn from the local workforce or the availability of temporary

housing resources at that time, but it is anticipated that PCW will work with local communities to ensure adequate housing for decommission/reclamation employees prior to initiation of these activities.

4.8.3.4 Community Infrastructure and Services

Construction-related demand for local government infrastructure and services would occur within communities near the CCSM Application Area, within the Application Area and on the highways and roads that provide access to the Application Area.

Primarily affected Carbon County services would be emergency response, emergency and urgent health care, law enforcement/criminal justice and county road maintenance, although most departments, agencies and service organizations would likely experience some effects.

As shown in **Table 4.8-4**, the peak population associated with Alternative 1R is estimated at 1,341, occurring during August and September of the first year of construction. Seasonal population estimates range from about 1,140 to 970 during the subsequent three construction years and would occur for about four months during each of those years. Construction-related population would be substantially less in other months of each construction year.

The estimated peak construction-related population during the first year would total about nine percent of estimated Carbon County population in 2009 (15,720) and eight percent to six percent in subsequent years. The challenge for Carbon County government – in fact the challenge for all communities and agencies that would provide services to the CCSM construction workforce – is that the service demand associated with the peak population would be temporary. Adding service capacity to accommodate such a brief annual peak in population would be inefficient and costly. In cases where certified personnel are required, such as law enforcement, emergency response and fire suppression, adding and equipping qualified staff for 2-to-6 months per year may not be possible. Although implementation of Alternative 1R would generate substantial sales and use tax revenues to local governments in Carbon County, these revenues would not flow in time to allow local governments to prepare in advance for accommodation of the first year construction peak, especially since major infrastructure components of the project (WTGs) would not arrive until the second year of construction. In such cases, where local government agencies are required to provide services to a substantially increased population without the resources or ability to increase service capacities, a reduction in levels of service for the existing population would be anticipated. Under current fiscal conditions, which have required local governments to cut services and staff, developing the capacity to accommodate the temporary spike in population would be particularly challenging (Section 3.8.6, Community Infrastructure and Services, and Section 3.8.7, Local Government Fiscal Conditions).

The Carbon County Sherriff's Office would provide law enforcement/criminal investigation, civil service, traffic enforcement, accident response, search and rescue and dispatch services to the Application Area and project access routes. In the past, high levels of industrial activity occurring in remote rural areas of the county have resulted in an increase in industrial accident calls, vehicle accidents, traffic infractions and crime (Colson 2009; Morris 2010). The Sheriff's office also provides criminal detention facilities in Carbon County.

The Carbon County Emergency Management coordinates emergency response services within the county and would likely coordinate the response to major emergencies such as large-scale industrial accidents and wild land fires within the CCSM Application Area and along project access routes.

The Carbon County Fire Department Rawlins and Saratoga divisions would likely experience an increase in vehicle accident responses and potentially wildfire responses associated with the CCSM construction project. The department also would respond to industrial accidents although to date, the department has responded to few calls related to wind energy project construction (Trapp 2010).

Emergency medical response and ambulance services within the CCSM Application Area, along I-80 and project access routes and within the communities of Rawlins and Sinclair would be provided by the Carbon County EMS (operated by MHCC) and the Wamsutter Health Care, Inc. Ambulance and emergency medical response services in Saratoga and along WY 130 would be provided by SCWEMS. Likely impacts on these agencies would include response to accidents along project access routes, depending on PCW's onsite emergency response and medical capabilities. It is anticipated that PCW will have industrial security, emergency response and emergency medical staff and resources on site in the CCSM Application Area during construction. To date, the extent and location of these resources has not been provided. Industrial accidents involving serious injuries would likely use Flight-for-Life transport to regional trauma centers.

For non-local CCSM construction workers, emergency, urgent and in many cases, routine health care services are likely to be provided by MHCC. Workers with minor to moderate injuries from industrial and traffic accidents are likely to be transported to MHCC. Because non-local construction workers would not have primary care physicians in the area, they would likely seek care routine or urgent at the MHCC emergency room or Rawlins Urgent Care.

The Carbon County Road and Bridge Department will experience additional demand for road maintenance services on WY71, WY76 and possibly on several county roads within the CCSM Application Area. It is likely that PCW and Carbon County would execute a road damage/road maintenance agreement prior to construction, which would incorporate the county's intentions for funding the cost of the additional road maintenance demand.

CCSM construction–related demand for Rawlins services would be associated with the relatively large numbers of non-local construction workers who would live and recreate within the city. Because the non-local construction workforce would be anticipated to live in existing temporary and conventional housing, the effects on municipal infrastructure such as water and wastewater systems would be limited to additional demand, which could be accommodated within the capacity of those systems.

Project-related travel to and from the CCSM worksite would create demand for traffic management services. Rawlins' experience with large industrial construction projects has been that demand for law enforcement, code enforcement, criminal justice and emergency response services have all increased and for law enforcement and criminal justice demand, the types of service provided have changed to more alcohol and minor assault types of crimes (Massey 2010; Reed 2010). The Rawlins Police Department staffing level during 2010 was 5.5 positions lower than 2008 levels and the Department would likely not add patrol staff on a seasonal basis, although the prospect of a multi-year construction period might support some hiring. If no additional staff is added, the level of service response for city residents as a whole would decline during peak project construction periods. Moreover, unless the general economy were to improve substantially before CCSM construction was initiated, the city would be unlikely to have sufficient revenue to restore staff positions lost during the recent recession.

Demand for code enforcement services would likely increase in the event that CCSM construction workers resort to using unconventional housing resources because apartments, motels and mobile home and RV parks become full. Construction workers charged with crimes, and code violations would increase the City Attorney's workload.

The Rawlins Fire Department would provide emergency response and fire suppression services within the City, along I-80 and portions of the WY71 access route to the project. Departmental staffing in 2010 was two fewer paid positions below levels in 2008, the cuts reflecting the effects of budgetary cutbacks in response to the recent recession. Response to fires and accidents on I-80 near the city and on project access roads would reduce coverage for emergencies within the city.

Because all construction materials are anticipated to be transported by rail to an IRF east of Sinclair and then via WY 76/CCR 407 and an internal haul road to the Application Area, minimal construction-related

truck traffic is anticipated for Rawlins. Although about 65 percent of the construction workforce (local and non local) is anticipated to live in Rawlins, workforce commuting for seven months out of each of 4 years is unlikely to substantially add to street maintenance demands.

Municipal solid waste generated by CCSM construction and the construction workforce would be transported from a transfer station in Rawlins to a regional disposal facility near Casper. Tipping fees are designed to cover the cost of waste disposal. The portion of the CCSM construction waste that is not recycled will be deposited in the Rawlins municipal landfill. Volumes of construction waste have not yet been provided so the effects on the landfill cannot be estimated.

Few construction workers are likely to live in Sinclair because there is no temporary housing and most conventional housing is occupied by refinery workers. CCSM-related demand for municipal service in Sinclair is likely to be transportation related. The proximity of the IRF and primary transportation route would indicate that the Sinclair police and fire departments would be the first responders to accidents and fires at the IRF and on the transportation route. Additionally, depending on PCW transportation policies and enforcement of such policies, some CCSM workforce commuters and other visitors to Sinclair may choose to access the project from I-80 Exit 219 on the west end of Sinclair, particularly during peak hours. As currently scheduled, a shift change at the Sinclair refinery would coincide with the CCSM construction shift change, which may result in more refinery workers using Exit 219 and passing through the town. This may result in more traffic enforcement demand for the Sinclair Police Department and increase the risk of accidents, as this route would have more traffic travelling through the residential and commercial part of town.

CCSM-construction-related service demand in Saratoga would be associated with the non-local construction workers residing in the town, currently anticipated to be about 115 workers at peak or six percent of 2009 total Saratoga population, based on the 2010 availability of housing. Because non-local workers would be staying in existing housing that is currently served with utilities, the incremental impact on these systems would be minimal. Service demand in Saratoga would be limited primary to law enforcement, emergency response and emergency and urgent health care.

Few non-local CCSM construction workers are likely to secure housing in Baggs, Dixon, or Wamsutter, or other Carbon County communities because of the limited temporary housing base in those communities and likely competition from other energy development projects. The relatively few CCSM construction workers who do reside in these communities are unlikely to generate substantial demand for local government services or infrastructure.

During project operations the relatively small CCSM workforce (the operations workforce would be about 10 to 15 percent of the peak construction workforce), the incremental resident population, traffic and activity within the CCSM Application Area and on access routes would correspondingly reduce demand for local governments' services and infrastructure. The associated demand for utility service would be accommodated within existing system capacities in Rawlins, and Saratoga, where the bulk of CCSM operations workers are likely to reside.

During project decommissioning and final reclamation, the non-local portion of the transient workforce performing these activities in the Application Area and traffic access routes to the Application Area would generate demand for a limited range of local government services including law enforcement, emergency response, health care and road maintenance from April through October each year. It is not possible to estimate the share of the decommissioning/reclamation workforce that will be nonlocal, where those workers would reside, or the capability of local government services to accommodate those demands some 30 or more years in the future, but it is assumed that PCW would cooperate with affected local governments on plans to accommodate the additional service demand prior to initiation of decommissioning and reclamation activities.

School districts serving the communities would see little increase in student enrollment related to either the construction or decommissioning activities. Consequently there would be no noticeable effects on staffing, facility or transportation needs. During long-term operations the districts could gain a combined total of 30 to 70 students over time, with the gains affecting multiple grade levels. The magnitude of the incremental enrollment is unlikely to require additional facility capacity, but might result in limited need for additional staffing. Revenues associated with the CCSM project that would accrue to CCSD #1 and the WSFC would be adequate to offset the additional costs.

4.8.3.5 Fiscal Effects

The initial capital investment in facilities and equipment, the depreciated value of that investment over time, purchases of other goods and services by PCW, its contractors, and households supported by the project would generate a series of one-time and recurrent revenues for the federal, state, and local governments.

The major revenue sources associated with Alternative 1R would include federal rental fees on the ROWS grant, state and local sales and use taxes on the purchases of taxable equipment and supplies by PCW, its contractors and employees, and local ad valorem (property) taxes on the value of the WTGs and ancillary facilities. Under a recently enacted state statute, wind energy producers will be assessed a $1.00/MW hour of energy generated annually (W.S. 39-22) after the first 3 years of operation. Carbon County also would realize an increase in lodging taxes associated with the seasonal influx of temporary workers during the 4-year construction period.

- Public land lease rental revenues: Wind energy generating facilities granted ROWs on public lands must pay annual rental fees (43 CFR 2806). All rent receipts derived from the wind energy ROWs are retained by the federal government. The rents are presently set at $2,365.00 per year per megawatt of installed capacity. Rents are phased in over a 3-year period once commercial production begins: 25 percent in Year 1, 50 percent in Year 2, and 100 percent in Year 3. Because neither the final locations nor specific turbine configurations have been determined for the CCSM, future rental rates are projected assuming 45 percent of the WTGs would be located on public lands, given either 2 MW or 3 MW capacity generator. Based on these assumptions, annual rents would accrue to the Federal Treasury based on completed capacity, such that annual receipts would begin in the third year of construction and increase over time to between $2.1 million and $3.2 million. These revenues would continue long-term over the life of the project.
- Local ad valorem/property taxes: projected capital development costs of Alternative 1R could range between $4.2 and $6.2 billion, depending on pending decisions regarding WTG capacity. Initially, the CCSM project would have an assessed value in the range of $483 million and $690 million (11.5 percent of improved value) declining over time as depreciation reduces the value of equipment. That assessment would qualify the CCSM as the single largest property taxpayer in the county, by a considerable margin. In recent years the County's tax base has been driven by increasing rates of natural gas production and prices, the latter resulting in a high risk of volatility. Such volatility is evident in the decrease in total assessed valuation for the county dropping by nearly 38 percent, from $1.22 billion in 2009 to $764 million for 2010. Relative to the latter value, the initial assessed value for CCSM would represent an increase of between 63 and 90 percent. Based on current tax rates, first year taxes on the project across all local tax entities would range between $29.7 million and $42.4 million. Approximately 20 percent of that total would accrue to Carbon County, 7 percent to various special districts and the remainder to support public education, not just locally but across the state based on Wyoming's education funding mechanisms. The $5.8 to $8.3 million that would accrue to Carbon County would be a significant boost in revenues given the County's total current general fund revenues of $22.1 million for 2010.

Ad valorem property tax revenues to the county, public education and special districts would decline over time as depreciation reduces the project's capital value. However, despite the effects of depreciation, the high initial value of the project would insure that such payments remain substantial for many years. Estimated total annual payments across all local tax entities after 10 years would be between $21.7 million and $31 million and cumulative ad valorem tax payments over that period range from $256.9 million and $367 million.

Rawlins and other municipal entities would realize some additional property tax revenues in conjunction with Alternative 1R as a result of the project's effects in promoting additional residential and commercial development and higher property values.

Ad valorem/property property taxes would continue over the life of the project, effectively ceasing following decommissioning and reclamation.

- Sales and Use taxes: Under the provisions of W.S. 39-15, capital equipment and related materials and supplies used in the construction of renewable energy projects, including wind energy, have been exempt from state and local sales and use taxes. Under legislation passed by the state legislature and enacted by Governor Freudenthal, that exemption will sunset effective January 1, 2012. Equipment purchased for use on qualifying projects and delivered in Wyoming prior to December 31, 2011, would still be eligible for the exemption. Under the current timetable for developing Alternative 1R, some equipment to be used on the CCSM would have been purchased and delivered. The current development schedule does not anticipate purchase and delivery of any of the WTGs prior to the sunset of the current tax exemption.

  Sales and use taxes are projected assuming no WTG deliveries prior to the sunset date, an overall construction budget of $4.2 billion to $6.2 billion, and a $400 million allowance for non-taxable outlays, such as non-local engineering and legal services, motor vehicle fuels, any payments to the BLM and other landowners for rights-of-way and easements. Given these assumptions Alternative 1R could yield between $216 million and $336 million in sales and use tax receipts. Of those sums, between $144 million and $244 million would be derived from the state's 4 percent levy; 69 percent of which accrues to the general fund. The remaining $44 million to $69 million, less a 1 percent administrative fee, would be distributed to local governments with a substantial portion returned to Carbon County and local municipal governments. Based on the population distribution within Carbon County, these revenues would provide a substantial source of revenues to the City of Rawlins and towns of Saratoga and Sinclair.

  In addition to the local share of the state's sales and use taxes, Carbon County would realize sales and use taxes from its 1 percent general purpose option tax and potentially its 1 percent specific purpose option tax, the latter contingent upon approval of any specific projects by local voters. Implementation of Alternative 1R could generate receipts totaling between $39 million and $55 million from each of these levies.

  Additional sales and use taxes would be generated over the life of the project however; they would be substantially lower in magnitude.

- Wind Production Taxes: In 2010, Governor Freudenthal enacted a wind energy production tax that had been approved by the 2010 Wyoming Legislature. The tax is a $1.00/MW hour produced annually by a commercial wind project. The statute (W.S. 39-22) provides a 3-year exemption from the date of initial production. Forty percent of the revenues generated by this tax will accrue to the state's general fund, with 60 percent distributed among counties where generating facilities are located. Although the distribution mechanism for the local share has not yet been finalized, it can be expected that a substantial share of the revenue will remain in the county where the power was generated. However, it is uncertain whether a share of the local revenue will flow through to municipalities.

  Under the current POD, initial commercial production is anticipated late in Year 2 or early in Year 3 of construction. Given the 3-year exemption, full scale taxable production would be

achieved in Year 7, yielding between $6.1 million and $9.2 million in annual tax receipts, depending on the final decision regarding the size/capacity of WTGs to be used.[4] Annual receipts accruing to the state general fund assuming full development and production would range between $2.4 million and $3.7 million. Revenues accruing to the local government distribution fund would range between $3.7 million and $5.5 million per year.

Wind production taxes would continue over the life of the project, fluctuating on a year-to-year basis in response to the amount of power produced.

The major public sector revenues projected in conjunction with Alternative 1R are summarized in **Table 4-8.6**.

Table 4.8-6 Summary of Major Public Sector Revenues Generated by Alternative 1R

Revenue Source	Projected Revenue	Revenues Distributed to:
Federal ROW grant rentals	$2.1 million to $3.2 million per year at full development	U.S. Treasury
Local ad valorem/property tax (including mandatory state levies)	$29.7 million to $42.4 million (Year 1) $21.7 million to $31 million (Year 10)	County, local and statewide public education, special districts. Rawlins benefits indirectly.
Sales and use tax	$216 million to $336 million (over 4 years) Much lower during operations	State general fund and local governments, primarily Carbon County, Rawlins, Saratoga and Sinclair
Wind energy production tax	$6.1 million to $9.2 million per year (at full production after 3-year exemption period)	State general fund and local governments, primarily Carbon County, Rawlins, Saratoga and Sinclair.

For local governments affected by the CCSM project, two important issues with respect to impact planning and mitigation are: 1) the potential lags between the availability of revenues and the need for expenditures to provide services, and 2) jurisdictional mismatches between demands and revenues. The former occurs when growth or other factors creates demands for services, but associated revenues are not received for some time due to inherent delays in the tax collection, distribution and budgeting processes. The timing of receipts is always important for local governments, but more so during periods of economic decline and fiscal shortfalls that reduces or eliminates reserves or reallocates funds without affecting other critical services. These periods of economic decline and fiscal shortfall such as the period occurring during 2008 through 2010 in Carbon County diminish local governments' capability to respond to growth-related demand.

Jurisdictional mismatches arise when a project such as CCSM generates substantial public revenues, but those revenues do not necessarily accrue to entities facing additional demands for services. Such situations are common in conjunction with natural resource development across Wyoming, when development and the associated revenue accrual occurs in unincorporated areas but many public service demands affect nearby municipalities; as would be the case with respect to ad valorem taxes levied by Carbon County, while the City of Rawlins faces many service demands. Over time, local

[4] Annual production based on a 35 percent capacity factor and 97 percent average productivity allowance.

governments in Wyoming have responded to such situations by engaging in various formal and informal cooperative service arrangements, including the creation of joint-powers boards. Joint powers boards are a quasi-governmental entity, authorized by Wyoming statute, that are created by agreement between two or more public entities for the purpose of providing one or more services within a defined service area, drawing on various financial resources of the participating entities.

Local governments and other public entities would realize increases in other charges for services, fees, and other taxes, for example lodging taxes, given the implementation of Alternative 1R. Such revenues would be substantially lower in magnitude than those identified above, but they would still be important to the specific entity involved.

Public service demands associated with the short-term and long-term population growth, jobs, housing, and other factors related to the Alternative 1R would result in incremental pressures on public sector expenditures. Although not quantified in this assessment, the scale of the incremental short and long-term demands on Carbon County associated with Alternative 1R would be relatively limited when the incremental revenues are considered. Moreover, the expansion of the tax base afforded by the project, although expected to decline over time, would be less volatile than that associated with natural gas development. That stability, combined with the larger tax base is another important benefit that would accrue from the project. Consequently, from a fiscal perspective, implementation of Alternative 1R is likely to be beneficial, both in the short-term and over the long-term. But is likely that during the initial construction year, local governments including Carbon County, Rawlins and possibly Sinclair and Saratoga would be required to provide services to accommodate CCSM traffic and workforce before they receive substantial revenues from the project. That fact, combined with recent cutbacks in some staffing levels could result in a deterioration of service levels in some local government services during the initial construction year, but such effects may be tempered in subsequent year as by rising revenues generated on activity in the preceding year(s).

Complete decommissioning and final reclamation would initially result in temporary increases in local sales tax receipts generated by consumer expenditures made by contractors and workers on the project. However, it also would signal the impending cessation of federal rental income, local ad valorem property taxes and wind production taxes, the latter affecting both the state and local governments.

4.8.3.6 Social Effects

Information for this section was drawn from scoping comments, local and regional newspapers, interviews with local officials and staff, and other sources as cited. A key source of information about attitudes and values among local residents was the Draft Carbon County Land Use Plan (Carbon County 2010) and the Planning Survey conducted as part of the land use planning process (Markert 2008).

Social effects of Alternative 1R construction would be associated with the presence of a large temporary and transient workforce in the Application Area, on project access routes, and in communities near the Application Area. Social effects also would be associated with the changing character of the Application Area and the surrounding view shed, which would affect the various publics, organizations and individuals differently, depending on their interests in the Application Area and other factors, such as the development of renewable energy.

Residents of Rawlins, Sinclair and Saratoga would experience project-related changes in the familiar landscape and seasonal changes in community social conditions during construction. Residents of, Baggs/Dixon and Wamsutter, though located more distant from the Application Area, could be affected by seasonal changes in community social conditions during the 4-year construction period, depending on PCW housing strategies and the availability of housing on these communities during construction.

Residents of Rawlins and Sinclair are familiar with the presence of energy development and construction workers in their communities. The activity in these communities associated with CCSM construction would be welcomed by many for the accompanying economic benefits and because of their support for renewable energy development. But for others, the recent experience with high levels of natural gas development and expansion of the Sinclair refinery has left wariness about the potential effects of future energy booms. During periods of CCSM construction, the increase in traffic and large numbers of construction workers in social settings such as stores, restaurants, bars, post offices and banks, may cause dissatisfaction for some long time residents. For the CCSM project, these peak periods would be temporary – a matter of a few months each summer for 4 years. The effects of the CCSM on social conditions in these communities would depend in large part on the level of other energy development and construction projects occurring concurrently in the area, and on PCW construction worker housing arrangements and policies for managing the construction workforce and the effectiveness of those arrangements and policies.

Saratoga has some experience in housing energy and construction workers. Community residents also are accustomed to housing seasonal tourists and recreation visitors. The relatively moderate number of CCSM construction workers expected to live in Saratoga, based on 2010 temporary housing availability, would likely not result in substantial social disruption in that community.

Baggs, Dixon, and Wamsutter are similarly familiar with energy development workforces. Few CCSM construction workers are anticipated to live in these communities due to the distance from the Application Area, the lack of substantial temporary housing resources (except in Wamsutter) and competition for housing from natural gas development projects near those communities. Consequently, social issues related to the CCSM construction workforce are likely to be minimal in these communities.

Some residents of communities and rural areas near the CCSM Application Area are likely to be dissatisfied with the change in character of the Application Area and adjacent view shed. As noted in Section 3.8.9, Non-Market Benefits and Values, and Section 3.8.10, Social Conditions and Trends, Carbon County residents value clean air and water, wildlife, wildlife habitat, and access to and the health of public lands. For many residents, the presence of large tracts of relatively open and wild lands in close proximity to their homes is one of the reasons they were attracted to and remain in Carbon County. Although many residents take pride in the fact that Carbon County has become a center for renewable energy development, they lament the loss of open space and changes in treasured landscapes. While there are those who have adopted positions of support or opposition to further wind energy development and the CCSM project, there are those that are ambivalent for the above reasons. There also is a strong private land rights ethic among many Carbon County residents, who believe that landowners have a right to develop their lands as they wish as long as such development does not threaten the health, safety and welfare of others and this group may support development of Alternative 1R even though they are concerned about changes in scenic vistas and open space that would accompany development.

The recreation assessment conducted for this EIS concludes that construction activities associated with Alternative 1R are not anticipated to preclude recreation activities and/or limit public access to recreation opportunities (Section 4.7.2, Impacts to Recreation from Alternative 1R, Applicant Proposed Alternative). This is in large part because most of the Application Area is located within the boundaries of TOTCO, which in combination with the checkerboard pattern of land ownership effectively limits access to much of the public lands within ranch boundaries. Construction activities would however, alter the character of the recreation setting on areas adjacent to the Application Area and along access routes to some recreation use areas. Some recreation users of the Application Area would likely be dissatisfied with the construction activity and change in recreation setting. Some local users with attachment to dispersed recreation areas open to the public south of T18N in the Sierra Madre site would likely be dissatisfied with construction activity, disturbance and changes in recreational setting.

Social effects of construction activities would be short-term and temporary, lasting approximately 7 months out of each construction year. Social effects of the change in character of the recreation setting would be long-term, extending through the operations and decommissioning phases of the project.

Livestock grazing activities within the Application Area would potentially be disrupted for much of the 4-year construction phase of the project, although the location of such disruption would vary over time in response to changes in the location of construction activities. The majority of project-affected grazing lands would be located in the Pine Grove/Bolten allotment, which is held by TOTCO. Although grazing operations on the Pine Grove/Bolten allotment would be most affected by construction, these effects are likely accounted for in the lease arrangement between PCW and TOTCO. Grazing operators on several other allotments also would be affected by disturbance, traffic along access roads that traverse allotments, by construction activities and by dust and reduced palatability of forage along access roads and near construction sites as described in Section 4.6, Impacts to Range, of this EIS. Livestock injury and mortality associated with vehicle/livestock collisions, damage to grazing improvements and wandering livestock resulting from gates left open during construction also are potential impacts. During intensive periods of construction, some operators may have to forego use of a particular pasture or reduce the scale of their cow-calf operations to reduce potential adverse effects. Other than TOTCO, affected grazing operators would not benefit economically from Alternative 1R. These potential impacts and changes in grazing operations would likely result in dissatisfaction and personal distress for some grazing operators, as well as the economic impacts described in Section 4.8.2.1, Assumptions. To the extent that the project-affected grazing operators also are affected on other allotments by energy development, or by weather, cattle, feed or fuel prices or other external factors, the effects of CCSM project-related impacts could be compounded.

Construction activities would likely evoke a mixed reception among two other affected publics:
1) individuals and organizations that place high value or priority on resource protection, species and habitat protection, clean air and water, and preservation of scenic vistas and open space, and
2) individuals and organizations that place high values or priority on development of renewable energy resources, reducing greenhouse gas emissions, and other efforts to address global climate change. For many people that identify with both of these values, the scale and location of Alternative 1R has generated concern for effects on wildlife habitat and movement, surface water quality, invasion of noxious and invasive species and scenic vistas and open space.

During project operations, social effects would be associated with the change in setting and character of the Application Area and surrounding view shed that was initiated during construction. The substantial changes in daytime vistas and nighttime skies would be distressing for some local residents and visitors to the Application Area. For some, these effects might be offset by the diversification of the local economy and additional tax base.

Social conditions and trends within the study area some 30 years or more in the future are impossible to predict, but the effects of decommissioning and final reclamation are likely to be associated with the accommodation of a relatively large, temporary and short term construction workforce and with returning the Application Area to a more predevelopment state, depending on the number of roads that are eventually reclaimed.

4.8.3.7 Environmental Justice

Implementation of Alternative 1R would not be anticipated to result in significant adverse impacts to human health and environmental resources, much less disproportionately high effects on minority or low-income populations in the region. Consequently, environmental justice concerns would not arise in conjunction with the Alternative 1R.

4.8.4 Alternative 2, Checkerboard Only

Alternative 2 considers wind development on public lands located within the Chokecherry site and those public lands located within the Sierra Madre site north of T18N, R88W. Privately owned and state lands located in these areas also are regarded as available for the development. As with Alternative 1R, Alternative 2 would involve the construction, operation and decommissioning of 1,000 WTGs and associated access roads, power collection lines, substations and interconnection line. Project access would remain the same under Alternative 2 however; the distribution of WTGs would be different, with increases in the number of WTGs in the Chokecherry and eastern portion of the Sierra Madre sites and offsetting decrease in the number of WTGs in the western portion of the Sierra Madre site compared to Alternative 1R. Although the total number of WTGs would be unchanged between the two alternatives, implementation of Alternative 2 would be anticipated to require construction of additional internal resource roads, turnarounds, and a more extensive collection system.

The long-term operations and maintenance workforce assumed for Alternative 2 would be between 114 and 158 at full development, the same as under Alternative 1R.

4.8.4.1 Local Economic Effects

From a socioeconomic perspective, the critical implication of the construction of an additional 100+ miles of internal roads and 85 turnarounds is that it would translate to a need for additional direct construction labor and potentially, a higher project construction cost. Increases in the direct manpower needs for the project would in turn support additional indirect and induced jobs in the region, during the construction period.

Detailed construction phasing and scheduling and estimates of the additional direct construction labor effort are not available for Alternative 2. Consequently, it is unclear whether the additional construction requirements would result in a higher peak workforce in Year 1, accomplishing more work in Year 1 but without affecting the peak, is spread out over Years 2 through 4, or some combination of the three. An increase in the peak workforce would result in higher levels of immigration of nonlocal labor to fill the available jobs. Spreading the additional effort over Years 2 through 4 would still result in the creation of more short-term jobs and higher personal income in the region; however, doing so would result in a higher degree of comparability between these years than is shown above on **Figure 4.8-1**.

Implementation of Alternative 2 would be accompanied by a strong seasonal increase in employment in April/May and a sharp decline in October/November, comparable to that for Alternative 1R.

Local lodging, retail and service establishments catering to construction workers would see an increase in business volume over the 4 year period as compared to Alternative 1R. The scale of the incremental effects on business revenues would be commensurate with the increase in construction labor associated with Alternative 2, but would likely be modest given the large base associated with Alternative 1R. Effects of Alternative 2 on local personal income would be comparable to those with Alternative 1R.

Long-term employment effects related to operations, and the temporary effects associated with decommissioning and reclamation would be comparable to those for Alternative 1R. Local businesses would see an increase in business volume related to local expenditures by the company, contractors and vendors providing ongoing maintenance services, and employees whose jobs are supported by the project. Local residential construction activity could increase for several years during the transition from construction to operations in order to supply additional housing demand.

4.8.4.2 Local Population and Demographic Effects

Local population effects under Alternative 2 would mirror short-term employment patterns described for Alternative 1R. Seasonal influxes would accompany the startup of construction each season, followed by a corresponding outflow when weather and/or seasonal wildlife closures bring construction to an end.

Generally, temporary population gains would be comparable to those under Alternative 1R, with the following caveat; higher immigration would be expected in Year 1 if the additional labor effort associated with Alternative 2 results in a higher peak employment impact. If the additional labor effort is distributed over Years 2 through 4, incremental population impacts would occur in each year, but be lower in magnitude, and most likely be below the peak in Year 1. Long-term population gains of up to 424 residents could occur in conjunction with operations under Alternative 2.

Most workers relocating to the area to fill jobs supported by the construction of Alternative 2 would be single-status/unaccompanied.

Implementation of Alternative 2 would, like Alternative 1R, result in little increase in the number of school-age children moving to Carbon County during construction. Long-term gains in enrollment of between 30 and 70 students could occur in conjunction with operations. Local school districts have adequate facility capacity, but may require additional staffing to accommodate the enrollment gains. These increases would result in little net impact on public education budgets due to the guaranteed funding provisions of the WSFP.

4.8.4.3 Housing Needs

As with Alternative 1R, Alternative 2 would involve the construction, operation and decommissioning of 1,000 WTGs. Project access would remain the same as Alternative 1R under Alternative 2. The project's direct labor requirements would be higher. An increase in labor resulting in a higher peak workforce in Year 1 would increase the shortfall in housing availability and associated needs for action by PCW to address housing. Higher project-related demand also would increase the competition with other market segments and also push nightly room rates higher.

Implementation of Alternative 2 with the additional labor force requirements distributed across several years would increase the project-related demand in those years, relative to Alternative 1R, with demand likely remaining below the peak demand in Year 1. Under this scenario, seasonal housing demands in Years 2 through 4 would represent more competition with other market segments, but the competition may not be as critical as during Year 1.

Housing needs during project operations would likely be met by a combination of existing units and new residential construction. Several existing and proposed subdivisions provide capacity to accommodate new construction. Local housing prices would likely rise in response to the increased demand for long-term housing.

4.8.4.4 Facilities and Services

Demands and the effects of those demands on public facilities and services, including public education, under Alternative 2 would generally be comparable to those described for Alternative 1R. As with employment and housing, temporary peak demands could be higher depending on the final sequencing of construction activity. However, there are no facilities or services facing critical capacity or staffing shortfalls where a difference in the incremental peak would likely result in a dramatic reduction in service levels or response capability as compared to the effects of Alternative 1R.

4.8.4.5 Fiscal Effects

The capital investment in facilities and equipment, purchases of non-capital goods and services by PCW, its contractors, and households support by the project would generate a series of one-time and recurrent revenues for the federal, state, and local governments. Like Alternative 1R, the major revenue sources associated with Alternative 2 would include federal rental fees, state and local sales and use taxes, local ad valorem (property) taxes, and wind energy production tax. Carbon County also would realize an increase in lodging taxes associated with the seasonal influx of temporary workers during the 4-year construction period.

- Public land lease rental revenues: Wind energy generating facilities granted rights-of-way on public lands must pay annual rental fees (43 CFR 2806). All rental receipts derived from wind energy right of way grants are retained by the federal government. Total generation capacity, and hence, projected production would be the same under Alternative 2 as for Alternative 1R. Projected annual rents accruing to the Federal Treasury of between $2.1 million and $3.2 million per year also would be the same. These revenues would continue long-term over the life of the project.
- Local ad valorem/property taxes: projected project development costs of Alternative 2 would be higher than the estimated $4.2 billion to $6.2 billion for Alternative 1R. The incremental cost difference is not known at this time, but it expected to be modest given that the bulk of the project cost lies in the cost of the WTGs, the road network, and electrical system included in Alternative 1R. The difference, in relative terms, would translate into a similar effect on the assessed valuation and ad valorem tax revenues over time, all other factors unchanged. As with Alternative 1R, Carbon County would realize benefits associated with the relative stability of the assessed value and tax revenues from the project.

  Rawlins and other municipal entities would realize additional property tax revenues in conjunction with Alternative 2 as a result of the project's effects in promoting additional residential and commercial development and higher property values, but the quantity of such receipts would not differ dramatically from those for Alternative 1R.

  Ad valorem/property property taxes would continue over the life of the project, effectively ceasing following decommissioning and reclamation.

- Sales and use taxes: With the pending sunset of the current exemption for capital equipment and related materials and supplies used in the construction of renewable energy projects, most, if not all of the WTG would likely be subject to sales and use tax. Sales and use taxes assuming no WTG deliveries prior to the sunset date would be slightly higher than $216 million to $336 million in sales and use tax receipts projected for Alternative 1R. Of those sums, the amounts accruing to both the state and to local governments would be proportionately higher than for Alternative 1R. Carbon County and local municipalities also would realize a proportionate gain to the increase in the taxable costs associated with the project. Revenues generated by the local 1 percent general purpose option tax and potentially by a 1 percent specific purpose option tax also would increase.

  Additional sales and use taxes would be generated over the life of the project; however, they would be substantially lower in magnitude.

- Wind production taxes: In 2010, Wyoming Governor Freudenthal enacted a $1.00/MW hour wind energy production tax. Forty percent of the revenues generated by this tax will accrue to the state's general fund, the remaining 60 percent distributed among counties where generating facilities are located. Although the distribution mechanism for the local share has not yet been finalized, it might reasonably be expected that a substantial share of the revenue will remain in the county where the power was generated. Given the 3-year exemption from tax provided for in statute, full taxable production would be achieved in Year 7 and yield between $6.1 million and $9.2 million in annual taxes beginning in Year 8, the amount varying with the size/capacity of WTGs used. Annual receipts accruing to the state general fund, assuming full development and production, would range between $2.4 million and $3.7 million. Revenues accruing to the local government distribution fund would range between $3.7 million and $5.5 million per year.

  Wind production taxes would continue over the life of the project, varying on a year-to-year basis in response to the quantity of power produced.

Table 4.8-7 summarizes the projections of the four major sources of public revenues that would result in conjunction with Alternative 2.

Table 4.8-7 Summary of Major Public Sector Revenues Generated by Alternative 2

Revenue Source	Projected Revenue	How Compares to Alternative 1R	Revenues Distributed to:
Federal ROW grant rentals	$2.1 million to $3.2 million per year at full development	Same	U.S. Treasury
Local ad valorem/property tax (including mandatory state levies)	More than $29.7 million to $42.4 million (Year 1) More than $21.7 million to $31 million (Year 10)	Higher	County, local and statewide public education, special districts. Rawlins benefits indirectly.
Sales and use tax	More than $216 million to $336 million (over 4 years)	Higher	State general fund and local governments, primarily Carbon County, Rawlins, Saratoga and Sinclair
Wind energy production tax	$6.1 million to $9.2 million per year (at full production after 3 year exemption period)	Same	State general fund and local governments, primarily Carbon County, Rawlins, Saratoga and Sinclair.

For local governments affected by the CCSM project, concerns with respect to potential lags in revenue receipts and jurisdictional mismatches with Alternative 2 would be the same as under Alternative 1R.

Local governments and other public entities would realize increases in other charges for services, fees, and other taxes, for example lodging taxes, given the implementation of Alternative 2. Such revenues would be substantially lower in magnitude than those identified above, but they would still be important to the specific entity involved. Although it is unclear as to whether the revenues would offset the costs incurred by a specific entity in serving project related demand, these revenues would generally accrue over time when incremental demands associated with the project would be minor.

Public service demands associated with the short-term and long-term population growth, jobs, housing, and other factors related to the Alternative 2 would result in incremental pressures on public sector expenditures. Although not quantified in this assessment, the scale of the incremental short and long-term demands on Carbon County associated with Alternative 2 would be limited when the incremental revenues are considered. Moreover, the expansion of the tax base afforded by the project, although expected to decline over time, would be less volatile than that associated with natural gas development. That stability, combined with the larger tax base is another important benefit that would accrue from the project. Consequently, from a fiscal perspective, implementation of Alternative 2 is likely to be beneficial, both in the short term and over the long term.

Complete decommissioning and final reclamation would generate temporary increases in local sales tax receipts generated by consumer expenditures made by contractors and workers on the project. However, it also would signal the impending cessation of federal rental income, local ad valorem property taxes and wind production taxes, the latter affecting both the state and local governments.

4.8.4.6 Social Effects

Social effects of Alternative 2 would be similar to those described in Alternative 1R. The potential for construction-related social disruption in Rawlins and Sinclair could be slightly different than that described for Alternative 1R depending on project scheduling.

4.8.4.7 Environmental Justice

Implementation of Alternative 2 would not be anticipated to result in significant adverse impacts to human health and environmental resources, much less disproportionately high effects on minority on low-income populations in the region. Consequently, environmental justice concerns would not arise in conjunction with Alternative 2.

4.8.5 Alternative 3, No Miller Hill or Sierra Madre

Alternative 3 considers development of 1,000 WTG on public lands within the Chokecherry site and within the Sierra Madre site east of the eastern half of T18N, R88W. Privately owned and state lands located in these areas also were considered available for the development. All lands (federal, state, and private) below T18N or in the western half of T18N, R88W, Section 21 are excluded from wind development under Alternative 3.

Although the total number of WTGs under Alternative 3 is the same as with Alternative 1R, the distribution of WTGs located in each site under Alternative 3 would differ substantially from the distribution under Alternative 1R. Under Alternative 3, approximately 25 percent more WTGs would be located in the Chokecherry site with 15 percent more WTGs located in the eastern portion of the Sierra Madre site. These increases would be offset by a reduction in the number of WTGs located in the western portion of the Sierra Madre site compared to Alternative 1R. Differences in distribution of WTG between the sites would require construction of additional internal resource roads, turnarounds, and a more extensive collection system.

It is assumed for this analysis that the long-term operations and maintenance workforce under Alternative 2 would be 114 at full development, the same as under Alternative 1R.

4.8.5.1 Local Economic Effects

As with Alternative 2, the critical implication associated with the construction of an additional 90 miles of internal roads and 76 turnarounds is that it translates to a need for additional direct construction labor and potentially, higher project construction costs. Increases in direct construction manpower needs would in turn support additional indirect and induced jobs in the region, during the construction period. As with Alternative 2, it is unclear whether the additional construction requirements would result in a higher peak workforce in Year 1, accomplishing more work in Year 1 but without affecting the peak, is spread out over Years 2 through 4, or some combination of the three. An increase in the peak workforce would result in incrementally higher levels of labor immigration to fill available jobs, whereas spreading the incremental effort over several years would create more short-term jobs and higher personal income in the region and reduce the year-to-year variations in labor shown on **Figure 4.8-1**.

Implementation of Alternative 3 would be accompanied by a strong seasonal increase in employment in April/May and a sharp decline in October/November, comparable to that for Alternative 1R.

Local lodging, retail and service establishments catering to construction workers would see an increase in business volume over the 4 year period as compared to Alternative 1R. The scale of the incremental effects on business revenues would be commensurate with the increase in construction labor associated with Alternative 2, but would likely be modest given the large base associated with Alternative 1R. Effects of Alternative 3 on local personal income would be somewhat higher than those with Alternative 1R.

Long-term employment effects related to operations, and the temporary effects associated with decommissioning and final reclamation would be comparable to those for Alternative 1R. Local businesses would see an increase in business volume related to local expenditures by the company, contractors and vendors providing ongoing maintenance services, and employees whose jobs are supported by the project. Local residential construction activity could increase for several years during the transition from construction to operations in order to supply additional housing demand.

4.8.5.2 Local Population and Demographic Effects

Local population effects under Alternative 3 would mirror short-term employment patterns. Seasonal influxes would accompany the startup of construction each season, followed by a corresponding outflow when weather and/or seasonal wildlife closures shut down construction for the year. Generally, temporary population gains would be comparable to those under Alternative 1R, with the following caveat; higher immigration would be expected in Year 1 if the additional labor effort associated with Alternative 3 results in a higher peak employment impact. If the additional labor effort is distributed over Years 2 through 4, incremental population impacts would occur in each year, but be lower in magnitude, and most likely be below the peak in Year 1.

Most workers relocating to the area to fill jobs supported by the construction of Alternative 3 would be single status/unaccompanied.

Implementation of Alternative 3 would, like Alternative 1R, result in little increase in the number of school-age children moving to Carbon County during construction. Long-term gains in enrollment of between 30 and 70 students could occur in conjunction with operations. Local school districts have adequate facility capacity, but may require additional staffing to accommodate the enrollment gains. These increases would result in little net impact on public education budgets due to the guaranteed funding provisions of the WSFP.

4.8.5.3 Housing Needs

As with Alternative 1R, Alternative 3 would involve the construction, operation and decommissioning of 1,000 WTGs. Project access would remain the same as Alternative 1R under Alternative 3. The project's direct labor requirements would be higher. An increase in labor resulting in a higher peak workforce in Year 1 would increase the shortfall in housing availability and associated needs for action by PCW to address housing. Higher project-related demand also would increase the competition with other market segments and also push nightly room rates higher.

Implementation of Alternative 3 with the additional labor force requirements distributed across several years would increase the project-related demand in those years, relative to Alternative 1R, with demand likely remaining below the peak demand in Year 1. Under this scenario, seasonal housing demands in Years 2 through 4 would represent more competition with other market segments, but the competition may not be as critical as during Year 1.

Housing needs during project operations would be met by a combination of existing inventory and new residential construction. Several existing and proposed subdivisions provide capacity to accommodate new construction. Local housing prices would likely rise in response to the increased demand for long-term housing.

4.8.5.4 Facilities and Services

Demands and the effects of those demands on public facilities and services, including public education, under Alternative 3 would generally be comparable to those described for Alternative 1R. As with employment and housing, temporary peak demands could be higher depending on the final construction schedule. However, there are no facilities or services facing critical capacity or staffing shortfalls where a

difference in the incremental peak would likely result in a dramatic reduction in service levels or response capability as compared to the effects of Alternative 1R.

4.8.5.5 Fiscal Effects

The capital investment in facilities and equipment, purchases of non-capital goods and services by PCW, its contractors, and households support by the project would generate a series of one-time and recurrent revenues for the federal, state, and local governments. Like Alternatives 1R and 2, the major public sector revenue sources associated with Alternative 3 would include federal rental fees, state and local sales and use taxes, local ad valorem (property) taxes, and wind energy production tax. Carbon County also would realize an increase in lodging taxes associated with the seasonal influx of temporary workers during the 4-year construction period.

- Public land lease rental revenues: projected annual rents accruing to the Federal Treasury under Alternative 3 would be between $2.1 million and $3.2 million per year, the same as under Alternative 1R and 2. These revenues would continue long-term over the life of the project.
- Local ad valorem/property taxes: projected project development costs of Alternative 3 would be higher than the estimated $4.2 billion to $6.2 billion for Alternative 1R. The incremental cost difference is not known at this time, but it expected to be modest given that the bulk of the project cost lies in the cost of the WTGs, the road network, and electrical system included in Alternative 1R. The difference, in relative terms, would translate into a similar effect on the assessed valuation and ad valorem tax revenues over time, all other factors unchanged. As with Alternative 1R, Carbon County would realize benefits associated with the relative stability of the assessed value and tax revenues from the project.

  Rawlins and other municipal entities would realize additional property tax revenues in conjunction with Alternative 3 as a result of the project's effects in promoting additional residential and commercial development and higher property values, but the quantity of such receipts would not differ dramatically from those for Alternative 1R.

  Ad valorem/property property taxes would continue over the life of the project, effectively ceasing following decommissioning and reclamation.
- Sales and use taxes*:* Most, if not all of the WTG would likely be subject to sales and use tax. Sales and use taxes assuming no WTG deliveries prior to the sunset date would be slightly higher than $216 million-to-$336 million in sales and use tax receipts projected for Alternative 1R. Of those sums, the amounts accruing to both the state and to local governments would be proportionately higher than for Alternative 1R. Carbon County and local municipalities also would realize a proportionate gain from the local share of the state's tax and from revenues generated by the local 1 percent general purpose option tax and potentially by a 1 percent specific purpose option tax also would increase.

  Additional sales and use taxes would be generated over the life of the project; however, they would be substantially lower in magnitude.
- Wind production taxes: Receipts from this tax would be the same as under Alternative 1R. At full production, this tax would yield between $6.1 million and $9.2 million in annual taxes, depending on the size/capacity of WTGs used. Annual receipts accruing to the state general fund would range between $2.4 million and $3.7 million and revenues accruing to the local government distribution fund would range between $3.7 million and $5.5 million per year.

  Wind production taxes would continue over the life of the project, fluctuating from year to year in response to the quantity of power produced*.*

The major public sector revenues projected in conjunction with Alternative 3 are summarized in **Table 4.8-8**.

Table 4.8-8 Summary of Major Public Sector Revenues Generated by Alternative 3

Revenue Source	Projected Revenue	How Compares to Alternative 1R and 2	Revenues Distributed to
Federal ROW grant rentals	$2.11 million to $3.12 million per year at full development.	Same as 1R and 2.	U.S. Treasury.
Local ad valorem/property tax (including mandatory state levies)	More than $29.7 million to $42.4 million (Year 1). More than $21.7 million to $31 million (Year 10).	Higher than 1R, and comparable to 2.	County, local and statewide public education, special districts. Rawlins benefits indirectly.
Sales and use tax	More than $216 million to $336 million (over 4 years).	Higher than 1R, and comparable to 2.	State general fund and local governments, primarily Carbon County, Rawlins, Saratoga and Sinclair.
Wind energy production tax	$6.1 million to $9.2 million per year (at full production after 3-year exemption period).	Same as 1R and 2.	State general fund and local governments, primarily Carbon County, Rawlins, Saratoga and Sinclair.

For local governments affected by the CCSM project, concerns with respect to potential lags in revenue receipts and jurisdictional mismatches with Alternative 3 would be the same as with Alternative 1R.

Local governments and other public entities would realize increases in other charges for services, fees, and other taxes, for example lodging taxes, given the implementation of Alternative 3. These revenues would be very comparable to the expected receipts under Alternative 1R.

Public service demands associated with the short-term and long-term population growth, jobs, housing, and other factors related to the Alternative 3 would result in incremental pressures on public sector expenditures. Although not quantified in this assessment, the scale of the incremental short and long-term demands on Carbon County associated with Alternative 3 would be limited when the incremental revenues are considered. The expansion and stability of the ad valorem tax base afforded by the project would be an important benefit that would accrue from the project. Consequently, from a fiscal perspective, implementation of Alternative 3 is likely to be beneficial, both in the short-term and over the long-term.

Complete decommissioning and final reclamation would initially be accompanied by temporary increases in local sales tax receipts generated by consumer expenditures made by contractors and workers on the project. However, it also would signal the impending cessation of federal rental income, local ad valorem property taxes and wind production taxes, the latter affecting both the state and local governments.

4.8.5.6 Social Effects

Social effects of Alternative 3 would be similar to those described in Alternative 1R. The potential for social disruption in Rawlins and Sinclair during construction could be slightly different than that described for Alternative 1R depending on project sequencing.

4.8.5.7 Environmental Justice

Implementation of Alternative 3 would not be anticipated to result in significant adverse impacts to human health and environmental resources, much less disproportionately high effects on minority or low-income populations in the region. Consequently, environmental justice concerns would not arise in conjunction with Alternative 3.

4.8.6 Alternative 4, Private Lands Only

Alternative 4 considers placement of WTGs on private lands only within both the Chokecherry and Sierra Madre sites. A total of 846 WTGs would be developed compared to 1,000 under Alternative 1R. Approximately 55 percent of the total would be developed in the Chokecherry site and 45 percent in the Sierra Madre site. Placement of the WTGs on private lands would require construction of an additional 142 miles of internal resource roads, 36 turnarounds, and a more extensive collection system. Other ancillary facility needs would be similar in scale, but more of the development would occur off-site. Projected direct construction manpower needs assuming implementation of Alternative 4 differ from that under Alternative 1R in that labor requirements to erect and commission WTGs would be reduced, while labor needs for road construction increase. Combining the two changes yields a net reduction in overall level of projected construction employment.

The reduction in the total number of WTGs is assumed to reduce the long-term direct operations and maintenance workforce to between 96 and 134 year-round employees at full development under Alternative 4. The difference would not result in appreciably different social and economic effects than would occur under the other alternatives.

4.8.6.1 Local Economic Effects

From a socioeconomic perspective, the critical implication of reducing the number of WTGs, while at the same time increasing the amount of off-site road construction, is that it would translate to somewhat less total direct construction labor and a lower total project construction cost. The net effect on labor requirement would not be expected to be substantially different from the total under Alternative 1R.

A net decrease in the direct manpower needs for the project would in turn support fewer indirect and induced jobs in the region, during the construction period. Although the net total labor required may be lower, it does not necessarily follow that the reduction in direct labor requirement would result in a lower peak workforce. The increase in road construction could result in a higher peak workforce in Year 1, if the objective is to complete all major access roads in a single year, or the additional effort could be spread over several years. Similarly, the reduction in construction effort associated with WTG construction and commissioning could be spread out over Years 2 through 4, or occur primarily in Year 4. An increase in the peak workforce would result in incrementally higher levels of labor immigration to fill available jobs, whereas spreading the incremental effort over several years would create more short-term jobs and higher personal income in the region and reduce the year-to-year variations in labor shown on **Figure 4.8-1**.

Implementation of Alternative 4 would be accompanied by seasonal increases in employment in April/May and declines in October similar to that with Alternative 1R.

Local lodging, retail and service establishments catering to construction workers would see increases in business volume over the 4 year period, but the increases would be of smaller scale than under Alternative 1R. Despite the smaller scale, these increases would represent benefits of the project.

Effects of Alternative 4 on local personal income would be lower during construction and operations. Differences in personal income during construction would reflect the net differences in construction labor associated with the increases in road construction and reduction in the number of WTGs completed. At full operations, the net stimulus to local personal income under Alternative 4 would be approximately 15 percent less than with Alternative 1R.

Long-term employment effects related to operations and the temporary effects associated with decommissioning and final reclamation would be comparable to, but smaller in scale, as those for Alternative 1R. Local businesses would see an increase in business volume related to local expenditures by the company, contractors and vendors providing ongoing maintenance services, and employees whose jobs would be supported by the project.

4.8.6.2 Local Population and Demographic Effects

Local population effects under Alternative 4 would mirror the timing and magnitude of short-term and long-term employment described in 4.8.6.1 above. Seasonal influxes and outmigration would accompany the startup and completion of construction each year. Temporary population gains during construction would be similar to those under Alternative 1R, with the following caveats; higher immigration would be expected in Year 1 if the additional labor effort associated with Alternative 3 results in a higher peak employment impact. If the additional labor effort is distributed over Years 2 through 3, incremental population impacts would occur in each year, but be lower in magnitude, and most likely be below the peak in Year 1. Concentrating the reduction in construction employment associated with the erection and commissioning of 15 percent fewer WTGs in Year 4 would result in lower temporary population impact. Other minor differences could arise on a year-to-year basis depending on modifications in construction schedule associated with the placement of WTGs only on private lands. Over the 4-year construction period, the two changes would offset each other to some extent, such that the net effects on population would not be dramatically different than under Alternative 1R.

Most workers relocating to the area to fill jobs supported by the construction of Alternative 4 would be single status/unaccompanied.

Implementation of Alternative 4, would like Alternative 1R, result in little increase in the number of school-age children moving to Carbon County during construction. Long-term gains in enrollment of between 30 and 70 students could occur in conjunction with operations. Local school districts have adequate facility capacity, but may require additional staffing to accommodate the enrollment gains. These increases would result in little net impact on public education budgets due to the guaranteed funding provisions of the WSFP.

4.8.6.3 Housing Needs

Implementation of Alternative 4 could result in slightly different demand for temporary housing, with the differences paralleling the net effects on peak and average employment during Years 1 through 4. Higher peak employment in Year 1 would result in a larger shortfall. Spreading the increased effort over several years could result in greater needs in Years 2 and/or 3, although there could potentially be offsetting reductions in demand associated with the 15 percent reduction in WTGs. The net result of these two trends would likely be overall housing needs comparable to those under Alternative 1R, with a potential for higher temporary peak needs in Year 1, and possibly lower in Years 3 and 4.

As with Alternative 1R, PCW will be required to assess housing availability and develop a construction worker housing plan at the time a Wyoming Industrial Siting Permit Application is submitted for the

project. The construction worker housing mitigation options listed under Alternative 1R would be available under Alternative 4.

Housing demand associated with operations under Alternative 4 would be reduced as compared to Alternative 1R, and would be accommodated in Rawlins and Saratoga over time. Despite the lower demand, upward pressure on housing prices and demand-induced new residential construction would occur under Alternative 4.

Housing demand associated with decommissioning/reclamation would be reduced under Alternative 4 compared to Alternative 1R as result of 15 percent fewer WTGs. As with Alternative 1R, effects of decommissioning and final reclamation on area housing conditions more than 30 years in the future.

4.8.6.4 Facilities and Services

Demands and the effects of those demands on public facilities and services under Alternative 4 would be similar to those described for Alternative 1R. As with employment and housing, temporary peak demands could be higher depending on the final construction sequencing, but lower in the latter years depending on labor force needs in Years 3 and 4. However, there are no facilities or services facing critical capacity or staffing shortfalls where a difference in the incremental peak would likely result in a dramatic improvement in service levels or response capability as compared to the effects of Alternative 1R.

4.8.6.5 Fiscal Effects

The capital investment in facilities and equipment, purchases of non-capital goods and services by PCW, its contractors, and households support by the project would generate a series of one-time and recurrent revenues for the federal, state, and local governments. Like the other action alternatives, Alternative 4 would generate substantial public sector revenues in the forms of state and local sales and use taxes, local ad valorem (property) taxes, and wind energy production tax. However, unlike the other alternatives, the lack of generating capacity development on Public lands would result in dramatically lower rental income to the Federal Treasury under Alternative 4. Carbon County would realize an increase in lodging taxes associated with the seasonal influx of temporary workers during the 4-year construction period.

- Public land lease rental revenues: Alternative 4 would generate rental income to the Federal Treasury based on an annual per acre rent for any linear ROWs associated with roads or power lines. The current rate for lands in Wyoming is $15.69 per acre, yielding projected total annual rent of less than $100,000 based on the conceptual development plan; considerably less than that under the other action alternatives. These revenues would continue long-term over the life of the project.
- Local ad valorem/property taxes: project development costs of Alternative 4 would be substantially lower than under Alternative 1R, $600 million to $900 million less assuming reduction proportional to the reduction in the number of turbines. The differences would translate into a similar effect on the assessed valuation and ad valorem tax revenues over time, all other factors unchanged. As with Alternative 1R, Carbon County would realize benefits associated with the relative stability of the assessed value and tax revenues from the project.

  Rawlins and other municipal entities would realize additional property tax revenues in conjunction with Alternative 4 as a result of the project's effects in promoting additional residential and commercial development and higher property values, but the quantity of such receipts would not differ dramatically from those for Alternative 1R.

  Ad valorem/property property taxes would continue over the life of the project, effectively ceasing following decommissioning and reclamation.

- Sales and use taxes: Most, if not all of the WTG would likely be subject to sales and use tax. Sales and use taxes assuming no WTG deliveries prior to the sunset date would be $194 million to $284 million in sales and use tax receipts, substantially lower than those projected for Alternative 1R. Of those sums, the amounts accruing to both the state and to local governments would be proportionately lower than for Alternative 1R. Carbon County and local municipalities also would realize a proportionate gain from the local share of the state's tax and from revenues generated by the local 1 percent general purpose option tax and potentially by a 1 percent specific purpose option tax also would increase.

  Additional sales and use taxes would be generated over the life of the project; however; they would be substantially lower in magnitude.

- Wind production taxes: Receipts from this tax would be approximately 15 percent lower than under Alternative 1R. At full production, this tax would yield between $5.2 million and $7.8 million in annual taxes, depending on the size/capacity of WTGs used. Annual receipts accruing to the state general fund would range between $2.1 million and $3.1 million and revenues accruing to the local government distribution fund would range between $3.1 million and $4.7 million per year.

  Wind production taxes would continue over the life of the project, varying on a year to year basis in response to the quantity of power produced.

The major public sector revenues projected in conjunction with Alternative 4 are summarized in **Table 4.8-9**.

Table 4.8-9 Summary of Major Public Sector Revenues Generated by Alternative 4

Revenue Source	Projected Revenue	How Compares to Alternatives 1R, 2, and 3	Revenues Distributed to
Federal ROW grant rentals	Unknown, but likely less than $100,000 per year at full development.	Much lower than other action alternatives.	U.S. Treasury.
Local ad valorem/property tax (including mandatory state levies)	More than $25.5 million to $36.1 million (Year 1). More than $18.6 million to $26.3 million (Year 10).	Lower than other action alternatives.	County, local and statewide public education, special districts. Rawlins benefits indirectly.
Sales and use tax	More than $194 million to $284 million (over 4 years).	Lower than for the other action alternatives.	State general fund and local governments, primarily Carbon County, Rawlins, Saratoga and Sinclair.
Wind energy production tax	$5.2 million to $7.8 million per year (at full production after 3-year exemption period).	Approximately 15% lower than for the other action alternatives.	State general fund and local governments, primarily Carbon County, Rawlins, Saratoga and Sinclair.

For local governments affected by the CCSM project, the issues with respect to potential lags in revenue receipts and jurisdictional mismatches would be the same with Alternative 4 as under Alternative 1R.

Local governments and other public entities would realize increases in other charges for services, fees, and other taxes, for example lodging taxes, given the implementation of Alternative 4. These revenues would be lower than the expected receipts under Alternative 1R.

Public service demands associated with the short-term and long-term population growth, jobs, housing, and other factors related to the Alternative 4 would result in incremental pressures on public sector expenditures. Although not quantified in this assessment, the scale of the incremental short and long-term demands on Carbon County associated with Alternative 4 would be limited when the incremental revenues are considered. The expansion and stability of the ad valorem tax base afforded by the project would be an important benefit that would accrue from the project. Consequently, from a fiscal perspective, implementation of Alternative 4 is likely to be beneficial, both in the short-term and over the long-term.

Complete decommissioning and final reclamation would initially be accompanied by temporary increases in local sales tax receipts generated by consumer expenditures made by contractors and workers on the project. However, it also would signal the impending cessation of federal rental income, local ad valorem property taxes and wind production taxes, the latter affecting both the state and local governments.

4.8.6.6 Social Effects

Social effects of Alternative 4 would be similar to those described in Alternative 1R. The potential for social disruption in Rawlins and Sinclair during construction would be similar to those described for Alternative 1R depending on project sequencing. Local support for the project could increase because all turbines would be located on private lands.

4.8.6.7 Environmental Justice

Implementation of Alternative 4 would not be anticipated to result in significant adverse impacts to human health and environmental resources, much less disproportionately high effects on minority or low-income populations in the region. Consequently, environmental justice concerns would not arise in conjunction with Alternative 4.

4.8.7 Mitigation and Mitigation Effectiveness

It is assumed that PCW will coordinate with affected units of local government and their staffs during the Wyoming Industrial Siting Permit Application process to identify potential impacts on community services and facilities and develop strategies to avoid, manage and mitigate potential impacts.

GEN-1: Four separate ROW grants would be issued as part of Phased Construction Sequencing. The sequencing is designed to limit disturbance to the area anticipated to be developed within the following 12 months.

Effectiveness: Implementation of this measure would effectively result in project development occurring over five construction seasons, rather than the four seasons included under the PCW's POD and the action alternatives. The net effects of the proposed ROW phasing would be to redistribute and extend the employment and related effects over five years, resulting in lower employment and associated demands on temporary housing and community services in the initial year of development, as compared to the corresponding levels under Alternative 1R. At the same time, temporary employment and related effects on temporary housing and community services would be extended by a year, and is higher than projected in the final year under Alternative 1R.

SOCIO-1: PCW will be required to develop and implement a Workforce Housing Plan to be approved in conjunction with a Wyoming Industrial Siting Permit that must be issued prior to the commencement of project construction. Carbon County, the City of Rawlins and, if appropriate, other Carbon County communities and Wamsutter should be consulted in the development of that plan. PCW should work with Carbon County and local communities to address housing needs associated with construction related indirect and induced jobs that would be created in the community. The plan should have an ongoing assessment element to monitor the types of housing used, residency patterns, and selected other characteristics in year 1, using the information to adapt and improve the plan for subsequent years.

SOCIO-2: PCW will work with the BLM and local governments near the PCW Application Area to develop and implement a plan to house non-local decommissioning and final reclamation workers and to ensure that local government services are adequate to accommodate the additional demand associated with the non local construction workforce, industrial activity and traffic prior to the initiation of these activities. The specific elements, strategies and programs to be used will be depend on the future availability of temporary worker housing and competing demands for housing at the time.

Effectiveness: Implementation of an approved Workforce Housing Plan could substantially reduce the potential for temporary housing shortages to become a major source of adverse socioeconomic impacts within the study area, particularly during the annual 2-to-3 month periods of peak employment. Such impacts would extend from housing to community services, public sector revenues, and social effects for workers and residents alike. The effectiveness of the plan will be contingent upon the specific elements, strategies, and programs used.

SOCIO-3: PCW should acquire and require its contractors to acquire Carbon County sales and use tax licenses and to the maximum extent practicable, purchase materials, equipment and supplies to be used on the project under these licenses so that proper attribution of sales and use tax payments can occur.

Effectiveness: Acquisition of local sales and use tax licenses and maximizing local purchases, to the extent practicable, is highly effective in insuring that local governments receive the maximum tax revenue benefit during the construction of the project. Such taxes are vital for local governments to address the temporary demands on public facilities and services.

4.8.8 Residual Impacts

Residual short-term effects will occur seasonally through construction and interim reclamation and again during decommissioning and final reclamation. The majority of the residual effects would be localized in the Rawlins/Sinclair area, although some effects would accrue to other communities. Reducing the peak employment levels during construction and extending the economic stimulus over five years in conjunction with the phased construction sequencing would generally enhance the short-term benefits associated with the project, while reducing the potential adverse social and economic impacts.

Residual long-term socioeconomic impacts associated with Alternative 1R and action alternatives would include effects on regional economic and social conditions, including limited immigration and associated population effects, increased sales revenues for local retail and service establishments, incremental increases in sales and lodging taxes, long-term effects on property and wind energy taxes, demands on public facilities and services (primarily law enforcement and emergency medical services), Many of these impacts will be viewed as beneficial, others as adverse.

4.8.9 Irreversible and Irretrievable Commitment of Resources

Development and operation of the CCSM project would require the commitment of natural, human, engineered, and monetary resources. Most of the non-monetary resource investments would be irretrievable and their use may preclude or foreclose other opportunities. Meeting the demands for goods and services directly and indirectly associated with the project, for example, the commitment of natural

and other resources to the construction of housing, or aggregate to build and maintain highways, also would be irreversible, although some reuse may occur.

4.8.10 Relationship between Local Short-term Uses and Long-term Productivity

Development and operation of the proposed project would provide economic support for households. Communities would benefit from additional investments and public entities, including the federal, state, and local governments, would derive revenues from the economic activities. Development of the wind resources would provide a source of renewable energy to residential, commercial, industrial, and public sector consumers. Some of the infrastructure put in place to service this project also may support future production and distribution of energy resource elsewhere in the region. Siting the project in this location would result in reductions in agricultural production and displacement of some dispersed recreation use in and near the area. However, once completed the energy harnessed from the wind by the project and transmitted to consumers would contribute to long-term economic productivity over the useful life of the project, both locally and across a broader region.

4.9 Impacts to Soil Resources

The following section summarizes the impacts on soil resources that may result from construction and operation of the proposed project. This section includes an overview of scoping issues identified for soil resources, impact assessment methodologies, significance criteria, and proposed additional mitigation measures, as applicable, that would minimize or mitigate potential significant impacts.

Potential impacts to soil resources were investigated by examining soil types, their extent, and their physical and chemical characteristics in relation to the proposed project. This was done using the project description, the BLM soil survey data, Supplemental Order 3 NRCS soil survey data (where available), and field verification as described in Section 3.9, Soils. The analysis of the impacts to soil resources is based on the assumption that AMCs and standard BMPs will be successfully implemented (see **Appendix C**). Acres of impacts described below were taken from tables in Section 2.4, Alternatives Considered in the EIS. Photos discussed in the following text are located in **Appendix F**.

Issues related to soil resources as identified during the scoping process include the following:

- Soil disturbance during construction activities resulting in accelerated soil erosion, exposed soils, the potential for mass failure, and reduced soil productivity;
- Potential for successful reclamation of droughty soils or soils with other reclamation constraints; and
- Soil contamination associated with potential spills of petroleum products, solvents, lubricants, or other chemical substances.

For impacts to soil resources to be deemed significant the following would have to occur:

- Soil loss is greater than 2 tons per acre per year in areas attributed to surface disturbance after reclamation;
- Reclamation is unsuccessful within 3 to 5 years of implementation;
- Soil productivity is reduced to a level that prevents the disturbed area from recovering to pre-disturbance soil/vegetation productivity levels;
- Unmitigated loss of wetlands or wetland function (EO 11990 and EO 11988) or activities that would degrade wetland/riparian areas such that, as a minimum physical state, PFC Standards for Healthy Rangelands (BLM 1997a) are not being maintained; or
- The alteration of stream channel geometry or gradient by accelerated runoff and erosion (e.g., undesirable aggradation, degradation, or side cutting) beyond what would be expected by natural processes.

4.9.1 Issues and Management Considerations

This project would have surface disturbing activities that fall into two categories, short-term and long-term. Short-term impacts are those impacts to soil resources that are related to initial grading, construction, and installation such as staging areas, road cuts and fills, lay down areas, and other remedial grading. Short-term impacts would be reclaimed following disturbance and returned to a condition that currently exists within 5 to 10 years following installation of the project. Long-term impacts are those impacts associated with features used for operations and maintenance of the project that would not be reclaimed until after the project is decommissioned at the end of the project's life. Long-term impacts include roads, turbine pads, substations, connector poles, etc. BLM's management goals, objectives, and actions for managing soil and watershed resources are listed in **Table 4.9-1** (BLM 2008a).

Table 4.9-1 Relevant Management Considerations for Soil Resources

BLM RMP and ROD – Soils
Management Objectives • Maintain or improve water quality by managing surface land use and groundwater resources, where practical and within the scope of the BLM's authority, according to the State of Wyoming Water Quality Rules and Regulations. • Maintain the hydrologic and water quality conditions needed to support riparian/wetland areas; minimize flood and sediment damage to water resources from human and natural causes; analyze and, where possible, minimize levels of salt loading in watersheds; and protect water resources used by the public (including impoundments, reservoirs, pipelines, and irrigation ditches) and by federal, state, and local agencies for fisheries, wildlife, livestock, agricultural, recreational, municipal, and industrial uses. • Address all accidental spills of environmental pollutants on federal lands according to RMP Appendix 32. • Implement intensive management of surface disturbing activities (RMP Appendix 13) in watersheds contributing to waterbodies listed on the Wyoming 303d list of waterbodies with water quality impairments or threats, within the BLM's authority. • Maintain or improve wetland/riparian areas as required by the Wyoming Standards for Healthy Rangelands (BLM 1997a). • Activities that would cause water depletion within the Colorado River system or North Platte River system will comply with existing agreements, decrees, rules, and regulations.
Management Goals • Maintain or improve surface and groundwater quantity and quality consistent with applicable state and federal standards and regulations. • Control or remediate sources and causes of pollution on federal lands in cooperation with other federal, local, and state agencies and private entities. • Maintain or reestablish proper watershed, wetland, aquifer, riparian, and stream functions to support natural or desired surface flow regimes that meet state water quality standards. • Minimize or control contributions of nonpoint source pollution from federal lands to all receiving waters (RMP Appendices 11 and 13). • Minimize or control elevated levels of salt contribution from federal lands to the Colorado River system, consistent with WDEQ water quality regulations. • Provide for availability of water to support uses authorized on federal lands where appropriate.
Management Actions • Intensive management of surface disturbing activities will be implemented in watersheds contributing to waterbodies listed on the State's 303d list of impaired waterbodies in consultation and cooperation with affected interests. • Rehabilitate or reclaim reservoirs and other water sources within BLM's authority that are functionally compromised and provide new water sources designed in support of resource management goals. Coordinate with local entities during planning and implementation of water source improvements when appropriate. • Manage water and soil resources to meet the Wyoming Standards for Healthy Rangelands. • Surface disturbing activities will be avoided on unstable areas, such as landslides, slopes of greater than 25 percent, slumps, and areas exhibiting soil creep. Reclamation practices and BMPs will be applied as appropriate for surface disturbing activities (RMP Appendix 13). • Surface disturbing activities will be avoided in the following areas: (1) identified 100-year floodplains, (2) areas within 500 feet of perennial waters, springs, and wetland and riparian areas, and (3) areas within 100 feet of the inner gorge of ephemeral channels. Exceptions to this will be granted by the BLM based on an environmental analysis and site-specific engineering and mitigation plans. Only those actions within areas that cannot be avoided and that provide protection for the resource identified will be approved.

Source: Proposed RMP, Final EIS for the RFO, Chapter 2, pp 2-49 through 2-50 (BLM 2008a).

4.9.2 Impacts to Soil Resources from the No Action

The No Action Alternative would involve BLM's denial of the applicant's request to develop on public lands and their request for access to private lands for wind development plus the assumption that the State of Wyoming would restrict development on private and state lands in the Application Area, or the proponent's choice not to proceed. Associated impacts to soils from construction and operation would not occur. Natural and anthropogenic actions such as agriculture, fire, recreation, and grazing would continue to impact soil resources at present levels in the project area.

4.9.3 Impacts to Soil Resources from Alternative 1R, Applicant Proposed Alternative

As described in Section 3.9, Soils, soil resources have been mapped by the BLM and updates are being completed by the NRCS. Data was supplemented by field visits to the Applications Area.

Alternative 1R would result in 7,221 acres of surface disturbance which would result in direct impacts to soil resources. Implementation of Alternative 1R, based on conceptual layouts, would occur on soils that have severe existing limitations according to the BLM and NRCS soil mapping. Although the alternative layout is conceptual, it is anticipated that because sensitive soils are widely distributed throughout the Alternative 1R area, total avoidance of these areas is not feasible (**Figures 4.9-1** through **4.9-5**, located in **Appendix F**). **Table 4.9-2** provides the acres of disturbance related to project area soil limitations for Alternative 1R. Acres were summarized in GIS using the conceptual layout and BLM and NRCS Order 3 soil survey data.

Table 4.9-2 Disturbance Acres Associated with Soil Limitations

Limitation	Alternative 1R		Alternative 2		Alternative 3		Alternative 4	
Water Erosion	**Initial**	**Long-term**	**Initial**	**Long-term**	**Initial**	**Long-term**	**Initial**	**Long-term**
Slight	768	324	887	363	907	366	1,014	388
Slight/Moderate	282	65	363	83	364	83	423	95
Slight/Severe	3,163	610	3,967	782	3,751	723	3,875	771
Moderate	483	101	526	99	560	106	468	89
Moderate/Severe	701	119	644	111	624	108	744	129
Severe	1,832	335	1,937	349	2,009	368	1,811	320
No Data	82	16	96	14	86	12	86	13
Wind Erosion								
Slight	45	9	18	3	1	0	59	11
Slight/Moderate	1,161	200	1,013	176	765	111	1,019	174
Moderate	5,889	1,316	7,128	1,574	7,249	1,603	7,143	1,583
Moderate/Severe	61	12	118	24	117	24	55	11
Severe	75	15	48	10	83	17	59	12
No Data	82	16	96	14	86	12	86	13
Runoff Potential								
Very Low	17	3	19	4	19	4	20	4
Low	18	4	59	12	59	12	52	10
Low to Moderate	19	4	42	9	41	9	4	1
Low to High	25	5	73	18	72	18	65	16
Moderate	1,077	232	1441	295	1,492	303	1,564	320

Table 4.9-2 Disturbance Acres Associated with Soil Limitations

Limitation	Alternative 1R		Alternative 2		Alternative 3		Alternative 4	
Water Erosion	**Initial**	**Long-term**	**Initial**	**Long-term**	**Initial**	**Long-term**	**Initial**	**Long-term**
Moderate to High	1,295	237	1612	306	1,288	241	1,665	318
High	4,743	1,066	5043	1,142	5,208	1,165	4,938	1,120
Very High	45	4	47	5	47	5	40	3
No Data	73	14	85	12	74	10	74	10
Topsoil Rating								
Poor	3,199	802	3843	938	3,961	962	3,921	952
Fair	1,593	300	1745	343	1,445	280	1,904	373
Good	2,094	390	2364	444	2,432	442	2,187	412
No Data	427	77	469	77	463	82	408	66
Road Rating								
Slight	196	38	200	40	0	0	159	33
Slight/Moderate	4	1	0	0	0	0	0	0
Moderate	4,193	795	4937	933	4,915	910	5,012	951
Severe	2,493	659	2,814	751	2,923	774	2,842	754
No Data	427	77	469	77	463	82	408	66

Note: GIS estimates use assumed component locations to generate disturbance associated with soil limitations. While these estimates may vary somewhat from disturbance estimates that were generated by assuming an average amount of disturbance associated with each project component proposed by alternative (as presented in Chapter 2.0), the difference is estimated to be less than 5 percent.

Surface disturbance associated with construction of project roads, towers, staging areas, transmission lines, and facilities would impact soil resources to varying degrees. The most notable long-term disturbance to soils would occur in association with construction of wind turbines, substations, and additional facilities. Approximately 1,500 acres associated with turbines, 607 acres associated with electrical collection system, and an additional 13,946 acres of soils initially would be disturbed during construction of the WTG road network, and during the construction of substations and other facilities.

Excavation, grading and leveling would be required to construct these facilities with the greatest level of effort required on more steeply sloping areas. During construction, the soil profiles would be mixed with a corresponding loss of soil structure. Soils would be compacted by hauling and construction equipment as a result of the construction of turbine and associated facilities with compaction maintained, at least in part, by continued vehicle and foot traffic as well as operational activities. Tower construction is proposed on the rim of Miller Hill. Considerable areas of mass instability were noted in this area (**Photos 189** and **204**, **Appendix F**). Although landslide deposits were avoided, as shown on the No Surface Use Constraints (**Figure 2-1**), additional areas along the rim of Miller Hill, Chokecherry Knob, Sheep Mountain, and the hogback were noted in the field as potential areas of mass instability. These areas could be a siting hazard for towers.

The potential for erosion would increase through the loss of vegetation cover and soil structure as compared to an undisturbed state. This is of particular concern in areas of vegetated sand dunes (**Photo 067**, **Appendix F**). If the vegetation is disturbed or denuded on dunes, dunes would be highly wind erodible. Additionally, fine textured soils are highly susceptible to erosion by water. These soils were common on the valley floor as noted in **Photos 216** and **259**, **Appendix F**. Soil productivity would

decrease, in like manner, primarily as a result of loss of surface soils and profile mixing along with the loss in vegetative cover.

Tower foundation excavation would result in a substantial amount of excess subsoil. The volume of excess subsoil that will be generated from tower construction has not been determined by PCW. The majority of subsoils in the area are commonly characterized as having high pH, salts, and sodium, as described in Section 3.9, Soils. If excess subsoils are spread or redistributed on the soil surface undesirable chemical or physical soil characteristics could create adverse impacts to soil quality for seedbeds and reclamation. PCW has committed to dispose of excess excavation materials in approved areas only or to stockpile suitable material for use in reclamation. Since PCW did not specify how material suitability would be determined, the BLM is recommending mitigation measure Soil 2 because it includes laboratory testing of excess soil to determine suitability.

A decrease in soil productivity and quality also would occur in association with planned soil salvage and stockpiling activities as microbial action is curtailed, at least to some degree, in constructed long-term stockpiles. These impacts would begin immediately as the soils are subjected to grading and construction activities and continue for the term of operations. Long-term soil productivity and quality would be impacted on 866 acres associated with WTG road network, 250 acres associated with turbines, 80 acres associated with the electrical collection system, and 349 acres associated with substations and facilities. Where soil productivity is reduced to a level that prevents the disturbed area from recovering to pre-disturbance soil/vegetation productivity levels, there would be localized significant impacts.

Numerous existing two track roads cross the Alternative 1R area. In some cases, existing roads may not be feasible for use by the project or may need to be modified or relocated. If existing parallel roads are not reclaimed when new roads are constructed, road density would increase considerably in the Alternative 1R area. Construction of the WTG road network within the Alternative 1R area would result in 3,946 acres of surface disturbance to soil resources. During construction, project roads would be a minimum width of 60 feet to allow for two way traffic and movement of cranes, haul trucks, and other vehicles, as well as, for topsoil storage and drainage ditches. However, road widths could reach a width of 150 feet or more in areas where cut and fill slopes would be required due to the uneven terrain and steeply sloping areas that are common within the Alternative 1R area. Roads result in a removal of land from the vegetative growing base, thereby interrupting nutrient cycling and altering soil productivity. Indirect effects may include landslides, gullies, generation of side cast materials, and disruption and interception of subsurface flow of water that could alter soil moisture regimes upslope and down slope from the road. Where the topography is relatively flat and grading occurs, disturbance would be limited to the upper subsurface soil horizons. As a result, subsurface soils would not be subject to profile mixing. Where cut and fill slopes occur, the soil profiles would be mixed with a corresponding loss of soil structure.

The proposed primary project access road would cross numerous perennial streams including Sage Creek, La Marsh Creek, Miller Creek, Little Sage Creek, and Hugus Draw. Section 3.6.4, Allotment Evaluation Status, provides a general assessment of these drainage systems based on proper functioning condition evaluations. Unpaved roads intercept surface runoff which provides a direct conduit for sediment to enter connected streams. **Photos 085** and **091** (**Appendix F**) depict the instability of the Little Sage Creek stream banks. The soils surrounding Little Sage Creek are highly saline and would be difficult to reclaim and prone to piping. Long-term increases in erosion and sedimentation to streams would be expected due to the long-term use of the roads. Please see Section 4.13.2, Impacts to Water Resources from Alternative 1R, Applicant Proposed Alternative, for further discussion on impacts associated with sedimentation to streams.

Traffic on roads during construction and operations would result in soil compaction. Soil compaction would considerably impact the upper profile subsoils immediately beneath the road surface but also would impact subsurface soils at a greater depth if fine textured soils are present. Soil compaction would result in a corresponding loss of infiltration, permeability, and soil aeration. Runoff and soil erosion would

increase as a result of compaction, as shown in **Photo 163** (**Appendix F**). Typically, soils that are compaction prone also are prone to rutting or displacement when saturated. Rutting occurs when the soil strength is not sufficient to support the applied load from vehicle traffic. The process of rutting physically severs roots and reduces the aeration and infiltration of the soil, thereby degrading the rooting environment. Rutting also disrupts surface water hydrology by damming surface water flows, creating increased soil saturation upgradient from ruts, or by diverting and concentrating water flows creating accelerated erosion. If travel by vehicles or construction equipment occurs on moist or saturated soil, where topsoil has not been removed and stockpiled (e.g., overland travel during construction or maintenance of overhead electric collection, communication, and transmission lines), rutting may mix thin topsoil with the subsoil, thereby reducing soil productivity. Rutting is most likely to occur on moist or wet fine textured soils, but also may occur on dry sandy soils due to low soil strength. Where road surfacing is applied this impact would be reduced. Erosion also would be minimized through the use of erosion control devices (e.g., silt fences, jute netting, hay bales, water bars, check dams, berms, shallow swales, and mulches). These impacts from the WTG road network, along with a loss in soil productivity, would occur on approximately 866 acres for the duration of the project and until successful reclamation is achieved. PCW has committed to suspend construction activities when soils are wet. While this measure reduces the impacts associated with soil rutting and compaction during construction this measure does not address the potential for soil impacts during operations and maintenance or decommissioning. In addition, there is no specific threshold established to determine when rutting is severe. Where saturated and other sensitive soils are located mitigation measure Soil 1 is recommended to reduce the potential for rutting and to prevent the upward movement of subgrade soils into the gravel cover.

During construction, staging areas would result in approximately 680 acres of surface disturbance. In general, staging areas would result in a temporary disturbance that would be reclaimed once construction is complete. Topsoil would be salvaged from staging areas and stored for future reclamation. Staging areas would then be graded, leveled and assumedly graveled. Soil resources in these areas would be impacted similar to trafficked roads as discussed above. Proposed locations for staging areas were visited during the field work performed in the summer of 2010. Staging areas were observed to be located in drainages, on rock outcrop (**Photos 131** and **138**), salt flats (**Photo 159**), gullied areas (**Photo 250**), or vegetated dunes (**Photo 137**).

Construction of the electrical system would result in 607 acres of surface disturbance to soils. The electrical system would require both underground and overhead collection and transmission lines and support road. Buried lines would require trenching of the soil resulting in modification of existing soil structure, and generating adverse impacts relative to aeration and permeability. It is likely that some mixing of textural zones would occur, as well as mixing of saline and/or alkaline materials with relatively salt-free materials. This mixing may create adverse chemical impacts to soil quality for seedbeds. Long-term soil productivity would be impacted on 80 acres, associated with the power line road and pole locations.

Impacts to soils would be reduced based on PCW's commitment to conduct interim and final reclamation to successfully restore productive land uses. However, revegetation of disturbed areas consisting of soils with severe limitations, such as poor topsoil and severe erosion potential, would be challenging. Several other factors would influence revegetation such as precipitation, slope, and soil depth.

In conclusion, impacts to soil resources are anticipated to be significant as follows:

- Because it is not feasible to completely avoid areas of severe and poor soil limitations, site-specific significant impacts to soil resources would be anticipated;
- Soil loss of less than 2 tons per acre per year is considered to be similar to background levels. Although the estimation of soil loss was not quantified for this analysis, surface disturbance to soil resources and loss of soil cover is anticipated to lead to soil erosion greater than 2 tons per acre per year (greater than background levels) and therefore, is considered to be significant;

- Because it is anticipated that some amount of topsoil would be lost (to erosive forces) or degraded (contaminated or diluted) soil productivity would be reduced in site specific areas to a level that prevents the disturbed area from recovering to pre-disturbance productivity levels and therefore is considered to be significant;
- Potential significant impacts to wetlands are further described in Section 4.11, Impacts to Vegetation; and
- Potential significant impacts related to stream channel alteration by accelerated runoff and erosion are described in Section 4.13, Impacts to Water Resources.

4.9.4 Impacts to Soil Resources from Alternative 2, Checkerboard Only

Alternative 2 would result in 8,795 acres of initial disturbance. Alternative 2 would have similar impacts to soil resources as described in Alternative 1R; however the acreage of total surface disturbance would be 1,574 acres greater than Alternative 1R. **Table 4.9-2** provides the acres of disturbance related to project area soil limitations for Alternative 2. Alternative 2 would result in fewer impacts to severely wind erodible soils than the other alternatives. The occurrence of soil limitations in relation to conceptual layouts for Alternative 2 is presented on **Figures 4.9-6** through **4.9-10**, located in **Appendix F**.

4.9.5 Impacts to Soil Resources from Alternative 3, No Miller Hill or Sierra Madre

Alternative 3 would result in 8,504 acres of initial disturbance. Alternative 3 would have similar impacts to soil resources as described in Alternative 1R, but the acreage of total surface disturbance would be 1,283 acres greater than Alternative 1R. **Table 4.9-2** provides the acres of disturbance related to project area soil limitations for Alternative 3. Alternative 3 would result in more impacts to severely wind and water erodible soils and soils with a poor topsoil rating than the other three alternatives. The occurrence of soil limitations in relation to conceptual layouts for Alternative 3 is presented on **Figures 4.9-11** through **4.9-15**, located in **Appendix F**.

4.9.6 Impacts to Soil Resources from Alternative 4, Private Lands Only

Alternative 4 would result in 8,918 acres of initial disturbance. Under this alternative, PCW would have the option to move forward with construction on private lands. Alternative 4 would result in similar impacts to soil resources as described in Alternative 1R, but the acreage of total surface disturbance would be 1,697 acres greater than Alternative 1R. **Table 4.9-2** provides the acres of disturbance related to project area soil limitations for Alternative 4. This alternative would result in fewer impacts to severely erodible soils than the other alternatives. The occurrence of soil limitations in relation to conceptual layouts for Alternative 4 is presented on **Figures 4.9-16** through **4.9-20**, located in **Appendix F**.

4.9.7 Mitigation and Mitigation Effectiveness

The following mitigation measures are common to all alternatives:

GEN-1: A phased construction approach mitigation measure identified as GEN-1 is discussed in Section 2.2, General Project Description, and described in further detail in Appendix A, Section A.1.3.1. This measure would have an overall beneficial impact on soil resources.

Effectiveness: The measure would reduce the amount of time exposed soils are subject to erosive forces. This would lead to overall vegetative vigor and health and forage for wildlife. It also would result in a reduction of fugitive dust from vehicular traffic and overall reduction of wind and water erosion. In addition, temporary storage of soils during a phased construction approach would be no longer than one year as opposed to multiple years under the proposed Alternative 1R construction sequence, resulting in less erosion and loss of soil productivity. Long-term storage of topsoil results in a reduction of microbial populations, biological crusts, and nutrient cycling. Reducing the amount of time the soil is stockpiled would help to maintain the biological and nutrient characteristics of the soil.

SOIL-1: Road fabric, or equivalent base stabilization as determined by the BLM, will be applied where roads cross sensitive soils (wet, severely erodible soils, and soils with low soil strength).

SOIL-2: Excess subsoil excavated from tower foundations will not be used as topsoil or spread on top of topsoil without further laboratory testing of the subsoil physical and chemical characteristics, and agency approval. PCW will identify the acceptable disposal method for excess subsoil in the final reclamation plan.

SOIL-3: Areas identified as having low reclamation potential will be avoided during construction unless an acceptable site-specific reclamation plan is approved by the BLM.

SOIL-4: To reduce impacts related to road density in the application area, roads that are no longer needed will be effectively reclaimed.

SOIL-5: PCW will be required to submit a snow removal plan as part of the ROW grant application. The snow removal plan will include measures to ensure protection of resources.

Effectiveness: The proposed mitigation measures would reduce most of the adverse effects to soil resources related to project construction, operation, and decommissioning. In addition, the proposed mitigation would increase the potential for successful reclamation. Measures 1, 2, 4, and 5, would facilitate reclamation efforts by maintaining soil quality, productivity, and biological characteristics. Measure 4 would reduce cumulative impacts within the cumulative impact analysis (CIA).

4.9.8 Residual Impacts

Mitigation measures are designed to reduce impacts to soil resources but do not fully mitigate the impacts. All of the alternatives would result in site specific losses to long-term soil productivity due to accelerated erosion and soil mixing. Because soil formation of topsoil is a slow process, it can take decades for topsoil to recover in the arid west and for soil productivity to improve.

4.9.9 Irreversible and Irretrievable Commitment of Resources

An irretrievable commitment of a resource is one in which the resource or its use is lost for a period of time. An irretrievable loss of soil productivity and quality would be lost on approximately 1,544 acres (Alternative 1R), 1,842 acres (Alternative 2), 1,780 acres (Alternative 3), or 1,871 acres (Alternative 4) associated with turbine locations, WTG road network, electrical network, and support facilities. Similarly, project roads would result in an irretrievable commitment of soil resources on approximately 866 acres (Alternative 1R); 1,153 acres (Alternative 2); 1,113 acres (Alternative 3); and 1,224 acres (Alternative 4). At the completion of the project, the towers, facilities, and roads would be removed and the disturbed areas associated with the project reclaimed, therefore no irreversible commitment of soil resources is anticipated.

4.9.10 Relationship between Local Short-term Uses and Long-term Productivity

Overall site productivity is primarily a matter of revegetation success. Productivity varies with vegetation community, but more importantly, with land management objectives as they relate to the establishment of desirable or productive vegetation types. In contrast, soil quality is an inherent soil resource characteristic involving aeration, permeability, texture, salinity and alkalinity, microbial populations, fertility, and other physical and chemical characteristics that are accepted as beneficial to overall plant growth and establishment. Based on this concept, there would be impacts to short-term uses and long-term productivity related to the quality of native soils after project-related disturbance, until successful revegetation is achieved.

4.10 Impacts Transportation

This section assesses the potential effects of the No Action Alternative, the Applicant Proposed Alternative, and other alternatives on the transportation system providing access to the CCSM Application Area (federal and state highways and Carbon County roads) and the public road network within the Application Area (WY 71 and CR 401/Sage Creek Road). Additional Carbon County roads within the Application Area may be assessed in a Traffic Management Plan that will be submitted to the BLM when final locations for WTGs are determined and access routes to the WTGs are identified. Transportation effects would be associated with the construction, operations and decommissioning/reclamation phases of the project. Transportation for the construction phase would be short-term and temporary, occurring over 7 months (April – October) in each of 4 construction years. Potential effects of new and improved roads within the Application Area on other resources (i.e., air and water quality, soils, vegetation, wildlife, land use, visual resources and noise) are assessed in the corresponding sections of this EIS.

The analysis area for transportation effects includes the public highways and roads providing access to and within the CCSM Application Area.

Effects of the Applicant Proposed Alternative and other alternatives on area transportation conditions were assessed by contrasting project-related transportation information (transportation modes, volumes and routing) provided by PCW in its Chokecherry and Sierra Madre Wind Energy Project PTMP (PCW 2010b) with existing level of service (LOS) and safety conditions on affected highways and roads.

Many of the transportation-related issues raised by the public and by federal and state agencies and interested organizations during scoping were associated with the potential effects of the development of internal roads and the traffic associated with project construction and operations on other resources such as air and water quality, soils, vegetation, wildlife, visual and noise. As noted above, these effects are assessed in the corresponding sections in this EIS.

Key transportation-related issues assessed in this section include the effects of high volumes of traffic, including overweight and oversized loads, on traffic conditions in communities and rural areas within the analysis area, on the condition of highways and roads, and on highway and road safety conditions.

Table 4.10-1 displays relevant transportation and access management considerations from the Draft 2010 Carbon County Comprehensive Land Use Plan (Carbon County 2010) and from the ROD and Approved Rawlins RMP.

Table 4.10-1 Relevant Management Considerations for Transportation and Access Management

Management Considerations
BLM RMP and ROD – Transportation and Access Management (BLM 2008)
<u>Management Objectives</u> • Maintain or expand, as determined necessary, existing access, including the right of access by a non-federal-land in-holder. • Abandon or close redundant or unnecessary access roads; reclaim after consultation with local government and interested parties. • Conduct transportation planning to manage existing and new access in a manner that ensures compatibility with resource values and management objectives. • Incorporate existing state and county road systems into BLM's transportation system to accurately show existing access. Coordinate access issues with state and local governments.

Table 4.10-1 Relevant Management Considerations for Transportation and Access Management

Management Goal • Develop and maintain a transportation management system to accommodate public demand for legal access through and across public land and to meet resource management needs and objectives (e.g., wildlife objectives).
Management Actions • The public land transportation system will be maintained or modified to provide for public health and safety and adequate access to public lands. • Routing and construction standards will be adjusted based on route analysis and engineering design. • When roads constructed under other initiatives are no longer needed for their original purposes, and prior to termination and obliteration of the road, BLM will assess its utility for addition to the BLM transportation system. • In close coordination with state and county governments, inventory all roads on public land and determine which roads are owned by the state and the respective counties. Based on the inventory and road determinations, develop a transportation plan to identify roads or trails under the jurisdiction of the BLM for closure, modification, or maintenance within the life of the plan. The plan will include goals, objectives, and maintenance standards for roads or trails to be retained for public use, and will contain specific measures to accomplish road closure. Roads or trails that are eroding beyond a reasonable level will be fixed or closed. • Manage transportation and access to meet the Wyoming Standards for Healthy Rangelands. • Consistent with Wyoming BLM access policy, opportunities to acquire or maintain legal access to the areas listed in Table 2-8 (in order of priority) will be pursued. Additional access needs will be identified on a case-by-case basis. • Consolidation of public lands will be pursued, when opportunities arise, to meet recreational demand. The criteria for which lands will be acquired include in-holdings within WSAs, some SD/MAs, and HMAs. • Road density will be considered during the analysis process and during authorization of surface disturbing and disruptive activities.
Carbon County Comprehensive Land Use Plan (Carbon County 2010)
Goal 6. Ensure that future land development is fiscally responsible and has adequate roads and other infrastructure.

The following assumptions were used for the transportation assessment:

- The transportation modes, traffic volumes and routing associated with Alternative 1R and other action alternatives would be as described in the PTMP.
- An IRF would be constructed and operated as described in the PTMP.
- All construction materials would be transported via rail to the IRF.
- Construction materials would be transported from the IRF to the CCSM Application Area over WY 76/CR 407 and a connecting internal haul road.
- WYDOT would grant approval for use of the bridge over I-80 at Exit 221 to transport overweight loads to the Application Area.

- WTG components would not be transported over local public highways and roadways during peak traffic hours.
- All contractors hauling loads that exceed WYDOT's oversize and/or overweight standards will acquire the requisite permits and comply with WYDOT safety regulations.
- Access road alignment within the CCSM Application Area will be determined during the preparation of detailed Traffic Management Plan, which will be submitted to the BLM RFO for review once the final project layout is developed. Portions of CR 505W (Miller Hill W. Road) and CR 505E (Miller Hill E. Road) may be utilized as part of that design. Any impacts to these roads based on the final design will be evaluated in the Traffic Management Plan.
- All use and modification of state highways will be conducted in accordance with WYDOT regulations.
- All use and modification of Carbon County Roads will be conducted in accordance with Carbon County regulations.
- All roads within the Application Area will be constructed to design specifications contained in the BLM Gold Book and BLM Manual 9113, where feasible.
- All public highway, roadway and intersection improvements needed to accommodate oversize and overweight vehicles will be completed prior to ongoing use of any highway, road or intersection by oversize and overweight vehicles. If changes are made to these intersections, they will be restored to their original condition at the completion of construction, at the discretion of WYDOT, Carbon County or the BLM.
- PCW will repair any highways or roads damaged by project-related use during construction, operations and decommissioning according to the terms of Road Damage Agreements with WYDOT and similar agreements with Carbon County and the BLM.

The following criterion is used to determine whether transportation impacts would be significant:

- Increases in traffic levels on the local public transportation system that would cause the LOS on the system to fall below acceptable levels as defined by the responsible government agency.

4.10.1 No Action Alternative

Implementation of the No Action Alternative would result in no impacts to transportation and access conditions in the analysis area. Under the No Action Alternative, the proposed project would not be developed because development and access to private lands for wind energy projects would be prohibited on BLM lands and development and access would be restricted on Wyoming state lands in the Application Area. The combined result of these restrictions would be to prohibit the development of the project or to discourage the proponent from proceeding with the project.

4.10.2 Alternative 1R, Applicant Proposed Alternative

Construction, operation and decommissioning/reclamation of the facilities associated with Alternative 1R including access roads, power collection and transmission lines, substations and an interconnection line, preparation of the wind tower bases, and erection of the WTGs (described in Chapter 2.0 of this EIS) would require movement of substantial amounts of materials, equipment, supplies and workers to and within the Application Area.

4.10.3 Construction

PCW's PTMP describes the proposed methods for transporting materials, equipment and supplies to and within the analysis area and discusses two options for workforce access to the Application Area. Unless otherwise stated, the following descriptions of transportation modes, volumes and routing are drawn from the PTMP.

As noted in **Appendix A**, the PTMP assumes construction of an IRF, referred to as the rail distribution center in the PTMP, on private land located east of Sinclair, within a 244-acre area in T21N, R86W, Sections 22 and 23. The proposed IRF site would essentially be bounded by WY 76 on the west, the UPR line on the north and I-80 on the south. All construction materials including aggregate and WTG components would be shipped by rail to the IRF.[1]

From the IRF, all construction equipment, materials and supplies would be transported by truck traveling south on WY 76, then across a bridge over I-80 east of Sinclair at Exit 221, east on WY 76 for about 1.25 miles, south for about 1 mile on CR 407 (CIG Road), ultimately connecting to an internal haul road, which would be constructed by PCW. The internal haul road would travel south/southwest across the Chokecherry site, exit the Chokecherry south boundary, and travel south across BLM and private lands for about 3.5 miles. The haul road would then divide; the east fork would travel south for about 0.5 mile and enter Sage Creek Basin within the Sierra Madre site and the west fork would travel about 2 miles west to enter the western portion of the Sierra Madre site. The haul road would cross CR 401 (Sage Creek Road) south of the point where WY 71 becomes CR 401 (**Figure 4.10-1**).

Vehicle traffic accessing the project site would include passenger vehicles and trucks hauling materials, supplies, fuel and aggregate, crane components and heavy earthmoving equipment, WTG components and transmission line towers and line. Many of the trucks hauling WTG components and heavy equipment would be over-width, overweight, and over-length vehicles. Heavy truck weights could range up to 100 tons per truckload. Oversize trucks would require special permits from WYDOT and escorts from the IRF to the CCSM project boundary.

Water trucks and concrete mixer trucks would be required to transport water and concrete for WTG foundations; these trucks would arrive on site at the beginning of a construction season and typically remain onsite for the duration of the season, hauling water and concrete from water sources and concrete batch plants within the Chokecherry and Sierra Madre sites. Similarly, trucks hauling cranes and heavy earthmoving equipment would transport that equipment to the site at the beginning of the construction season and from the site at the end of the season or whenever the equipment is no longer needed. Cranes and heavy equipment would stay within the site for the duration of the construction season during the last 3 years. Movement of water trucks, concrete mixer trucks, and heavy equipment to and from the Application Area would occur during months when overall construction traffic levels would be low, and would generate minimal congestion on project access routes.

The PTMP assumed two options for workforce access to the CCSM Application Area. The first option (haul road option) would require all workers to report to a staging area near the CCSM haul road and use the haul road to access the Application Area. Under this option, all workers would use I-80 and Exit 221 at Sinclair to access the staging area. The second option (WY 71/CR 401) would allow workers assigned to the Sierra Madre and Chokecherry south sites to use WY 71/CR 401 to its junction with the internal haul road or to several as yet undetermined points to access the Chokecherry and Sierra Madre sites.

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[1] Note that some miscellaneous construction materials may be procured locally as needed. Although trips associated with such purchases were not specifically identified in the PTMP, such trips are likely to be small in number and would not appreciably add to the traffic totals provided in the PTMP.

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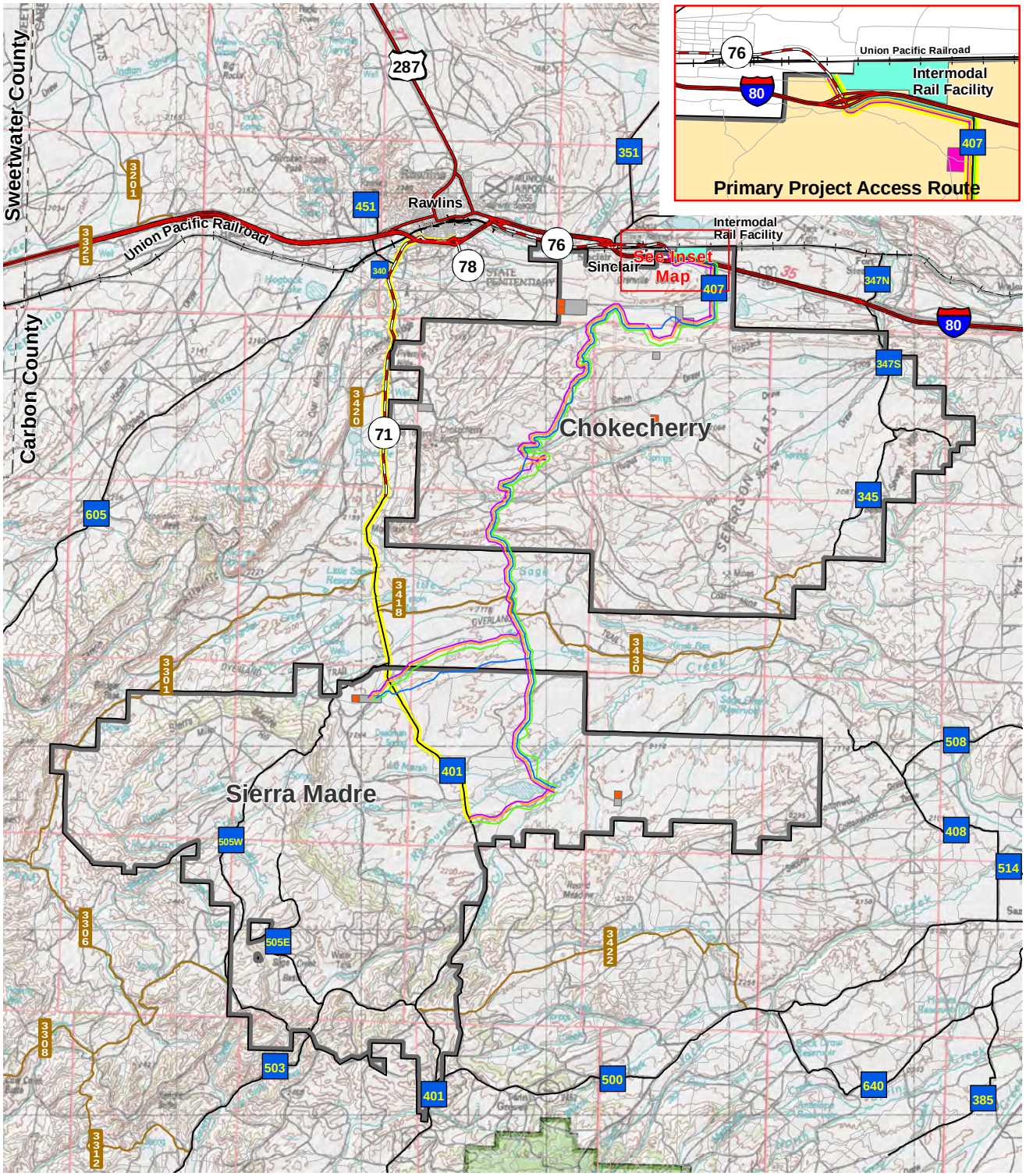


Legend

- Workforce Commuting Options
- **Haul Roads**
  - Alternative 1R
  - Alternative 2
  - Alternative 3
  - Alternative 4
  - Application Area
- Intersate Highway
- U.S. Highway
- State Highway
- County Road
- BLM Road
- Other Road
- Railroad
- Abandonded Railroad

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.10-1

Primary Project Access Routes and Internal Haul Road Alternatives

0 1 2 4 Miles
0 2 4 8 Kilometers
1:320,000
N

The local construction workforce would travel to the Application Area from existing residences within commuting distance. Non local workers would travel from temporary residences. The PTMP assumes that the construction workforce (local and non-local) would be housed in the following areas:

- Rawlins Area: 65 percent;
- East of Rawlins (Laramie area):10 percent;
- West of Rawlins (Wamsutter and Rock Springs areas): 15 percent; and
- South of Rawlins (Saratoga area):10 percent.

The PTMP assumed the above distribution would remain constant during all 4 construction years. The actual workforce distribution would depend on 1) PCW and its construction contractor's ability to recruit from the local labor pool; 2) housing availability in these communities during the construction period; and 3) any housing, housing incentive and transportation programs that PCW may implement. It is possible that some workers would be hired from the local labor pool in other communities north of Rawlins or in the Snake River Valley, and that some non-local workers would chose to live in those communities. However, given the size of those communities, their distance from the Application Area and their lack of substantial temporary housing resources, the numbers of such workers would likely be minimal and therefore result in negligible effects on transportation conditions.

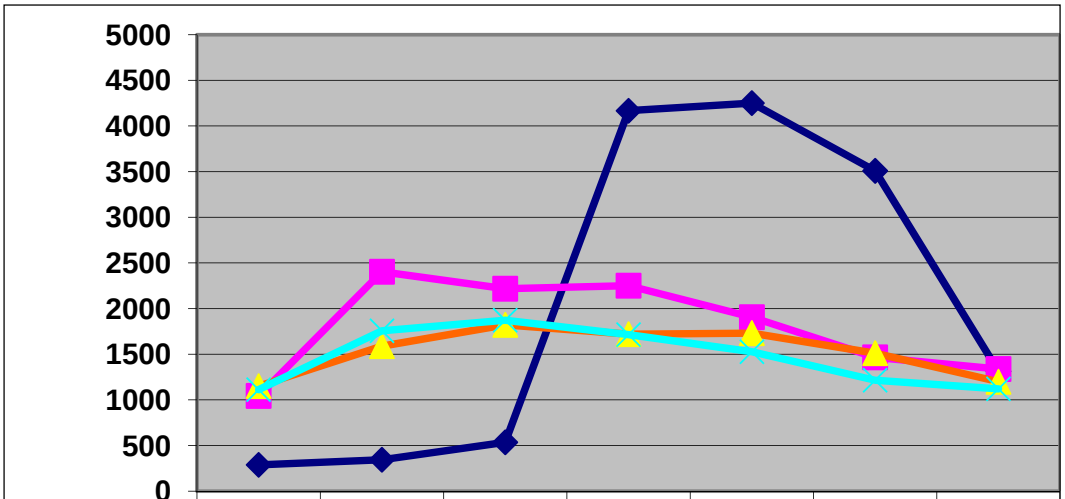
Some project workers also may choose to access the Application Area over Carbon County roads from the Saratoga area (CR 500/Jack Creek Road) and from the Little Snake River Valley (CR 503/McCarty Canyon Road), because of the substantially shorter distance to certain parts of the Application Area. However, because workers living in these areas would be relatively few in number and access on county roads is quicker only for certain portions of the Application Area, it is anticipated that their effects on road conditions would be minimal. Workers would be unlikely to use these routes if PCW requires all workers to enter the site via the internal haul road near Sinclair and implements methods to enforce that requirement.

CCSM construction related traffic is anticipated to occur from April through October during each of the four construction phase years. **Figure 4.10-2** displays estimated average daily traffic for each month over the 4 construction years.

As shown on **Figure 4.10-2**, average daily trips would be low to moderate at the beginning and end of each construction cycle, but rising to a peak during the middle of each season. Construction traffic during the first year would be dedicated primarily to construction of the road network within the CCSM Application Area and road construction would involve two 10-hour/day work shifts and high volumes of aggregate trips. The peak month for construction traffic to and from the CCSM Application Area would occur in August of the first year of construction, when an estimated 4,251 daily trips would be generated. During the 3-month July through September period of the first construction year, anticipated external traffic volumes of between 3,500 and 4,250 trips per day are forecast. During those 3 months, heavy trucks would account for between 48 and 68 percent of total traffic, virtually all which would be hauling aggregate from the IRF to the Application Area.

During the second year of construction, average daily traffic to and from the Application Area would be between 2,200 and 2,400 trips during the 3-month, May through July period. During the remaining months of all 4 years of construction, daily trips to and from the Application Area would average below 2,000.

For comparison, average daily traffic on WY 76 at a point north of the I-80 Exit 221 westbound off-ramp was 1,830 trips during August of 2010, which was the peak month of the year. During that same period, average daily traffic on CR 407 (CIG Road) south of I-80 was 120 trips and average daily traffic on WY 71 south of the I-80 underpass was 450 trips.



	APR	MAY	JUN	JUL	AUG	SEP	OCT
Year 1	289	345	536	4167	4251	3509	1313
Year 2	1044	2404	2218	2251	1906	1466	1338
Year 3	1151	1588	1821	1720	1731	1512	1199
Year 4	1111	1756	1873	1715	1527	1215	1121

Note: Estimates are 1-way trips, reflecting both inbound and outbound trips. On average, 50 percent of the trips would be in each direction.

Source: PCW 2010b.

Figure 4.10-2 CCSM External Construction Daily Traffic Estimates by Month

Although the incremental traffic associated with the construction phase of Alternative 1R would be substantial, particularly during peak construction months, the highest traffic volumes would be concentrated in two areas:

- The segment of WY 76/CR 407, from the access point to the IRF to the CCSM internal haul road, a distance of about 3 miles, would experience the highest concentrations of traffic, especially during peak months in construction Years 1 and 2.
- If the WY 71/CR 401 workforce commuting option is selected, that segment would experience relatively elevated volumes of passenger vehicle traffic, primarily during shift changes, during construction Years 1 through 3 when road building and WTG construction would occur in those areas.

A common way to measure the effects of increased traffic volumes on highways, streets and roads is to determine how changes in traffic volume would affect the LOS on highways, streets, roads and at intersections. LOS ratings (A through F) are assigned to highways, streets and roads based on measures (speed, travel time, freedom to maneuver, traffic interruptions, comfort and convenience) that characterize the operational conditions within traffic streams and the perceptions of those conditions by motorists. LOS A represents the best or free flowing travel conditions and LOS F represents the worst. LOS ratings for intersections are based primarily on delays experienced by drivers traveling through those intersections.

The CCSM PTMP assessment focuses on potential changes in LOS at affected intersections. **Table 4.10-2** displays LOS criteria for intersections controlled with traffic signals or two-way stop signs.

Table 4.10-2 LOS Criteria for Signalized and Two-Way Stop Controlled Intersections

LOS	Control Delay per Vehicle (seconds per vehicle)	
	Signalized Intersections	Two-way Stop Controlled Intersections
A	<10	0 – 10
B	>10 – 20	>10 – 15
C	>20 – 35	> 15 – 25
D	>35 – 55	>25 – 35
E	>55 – 80	>35 – 50
F	>80	>50

Source: PCW 2010a.

For the first year of construction, the assessment conducted for the PTMP assumed that the two road construction work shifts would change during a one hour period between shifts. This period also would coincide with the shift end period for single shift construction workers. Consequently, the first construction year peak work hour would occur during 4:00 to 5:00 pm when the daytime crew would be leaving the work site and the evening crew would be arriving. This assumption yields a worse case analysis. Overlapping shift changes, wherein one shift arrives at work and the other shift then leaves would reduce peak hour impacts by approximately 50 percent.

For the remaining three construction years, the peak hour would occur during both morning and afternoon shift changes, but would be substantially lower because only a single shift would be involved.

During the first year of construction, workers and trucks arriving at the CCSM worksite for the morning shift (6:00 to 7:00 am) would total about 900 vehicles and workers and trucks leaving the worksite at the end of the evening shift (2:00 to 3:00 am) would total about 575 vehicles; traffic at these times would essentially be traveling in one direction once the vehicles reached the access route.

Construction Year 1 peak hour traffic, which as noted above would occur during the afternoon shift change, would total about 1,250 trips, of which 1,060 would be associated with workforce commuting and 190 would be associated with trucks hauling material and equipment. As noted above, these estimates include both inbound and outbound trips. Under the workforce commuting option that would require all workers to enter the CCSM worksite via the internal haul road, all 1,250 trips would converge on WY 76 in the vicinity of I-80 Exit 221. The PTMP anticipates that cross lane turning movements by arriving workers to access WY 76 from the westbound I-80 off ramp and by departing workers to access the eastbound I-80 on ramp would encounter difficulty crossing the high volumes of both inbound and outbound workers and trucks going to the IRF to load up for delivery to the work site.

Consequently, during construction Year 1, the projected peak hour traffic would result in congestion on the access route leading to the CCSM haul road, causing substantial delays at intersections on either side of the bridge over I-80 at Exit 221. These effects would be particularly acute at the westbound I-80 off ramp and the eastbound I-80 on ramp at Exit 221 during shift changes during July through September.

Outside of the peak hour, construction Year 1 traffic (primarily aggregate trucks) traveling to and from the CCSM site during off peak hours would average about 85 trips per hour during the remaining 18 hours of the 21-hour workday (two 10-hour shifts plus 1 hour for shift changes). The resulting congestion and delay associated with that level of traffic would be minimal in comparison to that associated with the three peak-hours.

If the WY 71/CR 401 workforce commuting option is implemented, the volume of workforce traffic on WY 76 at Exit 221 would be substantially reduced. Conversely, under this option increased traffic and congestion on WY 71/CR 401 and delay and reductions in LOS could be anticipated at the access point to the Sierra Madre site during shift changes. During other hours of the workday, congestion and delay on this route are likely to be minimal with the exception of the point where the internal haul road would cross CR 401 (Sage Creek Road).

Table 4.10-3 contrasts existing LOS ratings with anticipated construction Year 1 peak hour LOS ratings changes under the two workforce commuting options for key intersections within the CCSM transportation assessment area.

Table 4.10-3 LOS and Delay at Key Intersections in the Analysis Area: Existing Conditions Contrasted with Conditions with the Alternative 1R Construction Year 1 Under Two Workforce Commuting Options

Applicant Proposed Alternative Construction Year 1 Peak Hour (4:00 – 5:00 p.m.)						
	August 2010 Peak (Afternoon Rush Hour)		All Workers Use Exit 221 Option 1		Workers Allowed to Use WY 71 Option 2	
Intersection	Delay	LOS	Delay	LOS	Delay	LOS
US 287 Bypass/Higley Boulevard and 3rd Street	10.5	B	10.5	B	9.7	B
US 287 Bypass/Higley Boulevard and Cedar Street	10.5	B	10.9	B	10.6	B
WY 71 and Jackson Street	9.0	A	9.2	A	12.1	B
WY 71 and Washington Street	9.3	A	10.1	B	12.4	B
WY 71/ Locust St and South Higley Boulevard	10.1	B	13.0	B	15.7	C
I-80 Eastbound and Spruce Street	9.7	A	10.0	B	9.8	A
I-80 Westbound and Spruce Street	10.6	B	11.1	B	11.0	B
I-80 Eastbound and Higley Boulevard	9.7	A	10.5	B	12.9	B
I-80 Westbound and Higley Boulevard	10.3	B	10.9	B	11.7	B
I-80 Eastbound and WY 76	9.2	A	14.6	B	11.5	B
I-80 Westbound and WY 76	8.8	A	>300	F	41.5	E
WY 76 and Rail Distribution Center	n/a	n/a	9.8	A	9.8	A
South WY 71 and Sierra Madre Access Point	n/a	n/a	10.2	B	16.8	C

Note: Delays are presented in seconds per vehicle.

Source: PCW 2010b.

As shown in **Table 4.10-3**, implementation of Alternative 1R with the haul road workforce commuting option would result in relatively minor incremental delays and reductions in LOS for all intersections during the peak hour of construction Year 1[2], with the exception of the intersection at the I-80 westbound off ramp and WY 76. It is estimated that average delays per vehicle at this intersection would increase from 8.8 seconds to greater than 300 seconds and the LOS would decrease from A to F. This would be a significant impact under the criteria adopted for this assessment. The intersection at the I-80 Eastbound ramp and WY 76 would experience an incremental 5.4 second per vehicle delay which would reduce the LOS at that intersection from A to B.

The PTMP has identified the westbound I-80 off ramp at Exit 221 as a location where measures would be required to insure traffic safety. During peak periods, traffic would queue up on the off ramp. The PTMP estimates that the maximum queue would be 31 vehicles or 620 feet. Because the length of the off-ramp is over 2000 feet, the PTMP forecasts that the queue would not back up onto the interstate.

Under the WY 71/CR 401 workforce commuting option, it is estimated that 23 percent of the construction workforce would access the Application Area via this route and construction Year 1 traffic delays and decreases in LOS during peak hours at key intersections in the analysis area would similarly be minor. Delays at the I-80 Westbound ramp and WY 76 would average 41.5 seconds per vehicle and the LOS at that intersection would decrease to C, compared to a greater than 300 second delay and LOS F for the haul road workforce commuting option. Traffic delays at the I-80 Eastbound ramp and WY 76 intersection would experience an incremental 2.3 second per vehicle delay which would reduce the LOS at that intersection from A to B under the WY 71/CR 407 workforce commuting option.

Under the WY 71/CR 407 workforce commuting option, the incremental increase in traffic would result in a 2.7-second-per-vehicle increase in delay for the intersection at the intersection of WY 71/Locust Street and Higley Boulevard and deterioration in LOS from B to C during the peak hour. Additionally, the intersection of CR 401 with the internal haul road at the Sierra Madre access point would experience a 4.6-second-per-vehicle longer delay than under the haul road commuting option and the LOS at this intersection would drop from B to C.

Table 4.10-4 contrasts 2010 peak hour LOS ratings at selected intersections with estimated peak hour delays during the second year of construction and LOS under the two workforce commuting options. (Note: Effects for construction Years 3 and 4 are not shown because the incremental traffic associated with Alternative 1R would be similar but slightly lower than for construction Year 2.)

As shown in **Table 4.10-4**, peak hour vehicle delays and reductions in LOS at key intersections would be minimal under the haul road workforce commuting option during construction Year 2, with the exception of the eastbound and westbound ramp intersections of I-80 and WY 76. The delays at the westbound intersection would increase to 76.2 seconds per vehicle resulting in a LOS F (a significant adverse impact under the criteria used for this assessment) and delays at the eastbound intersection would increase to 18.4 seconds per vehicle resulting in a LOS C.

[2] Effects on intersections within Rawlins could be different than those contained in the PTMP forecasts if the residential distribution of workers to communities and within the City of Rawlins were substantially different than the distribution assumed for the PTMP. It is assumed that the Traffic Management Plan that will be prepared before construction is initiated will provide additional detail about workforce residency and potential effects on key intersections.

Table 4.10-4 LOS and Delay at Key Intersections in the Analysis Area: Existing Conditions Contrasted with Conditions with the Alternative 1R Construction Year 2 Under Two Workforce Commuting Options

Applicant Proposed Alternative Construction Year 2 Peak Hour (4:00 – 5:00 p.m.)						
	Existing PM		All Workers Use Exit 221 Option 1		Workers Allowed to Use WY 71 Option 2	
Intersection	Delay	LOS	Delay	LOS	Delay	LOS
U.S. 287 Bypass/Higley Boulevard and 3rd Street	10.5	B	9.7	A	9.7	A
U.S. 287 Bypass/Higley Boulevard and Cedar Street	10.5	B	11.7	B	11.2	B
WY 71 and Jackson Street	9.0	A	9.0	A	11.6	B
WY 71 and Washington Street	9.3	A	9.7	A	10.8	B
WY 71/Locust Street and South Higley Boulevard	10.1	B	12.2	B	11.9	B
I-80 Eastbound and Spruce Street	9.7	A	10.0	A	10.1	B
I-80 Westbound and Spruce Street	10.6	B	10.1	B	10.1	B
I-80 Eastbound and Higley Boulevard	9.7	A	9.7	A	10.7	B
I-80 Westbound and Higley Boulevard	10.3	B	10.7	B	11.1	B
I-80 Eastbound and WY 76	9.2	A	18.4	C	13.6	B
I-80 Westbound and WY 76	8.8	A	76.2	F	17.3	C
WY 76 and Rail Distribution Center	n/a	n/a	9.5	A	9.5	A
South WY 71 and Sierra Madre Access Point	n/a	n/a	9.9	A	14.4	B

Note: Delays are presented in seconds per vehicle.

Source: PCW 2010b.

Under the WY 71/CR 401 workforce commuting option, an estimated 42 percent of all construction workers would travel to the Application Area via this route during construction Year 2. Consequently, delays would increase slightly at most of the selected intersections, because WTG construction work in the Sierra Madre and eastern Chokecherry sites would induce workers to access these work sites via WY 71/CR 401. The eastbound and westbound ramp intersections of I-80 and WY 76 would experience delays, but these delays would be substantially less than those anticipated under the haul road workforce commuting option. Construction Year 2 delays at the westbound I-80/WY 76 intersection would increase to 17.3 seconds per vehicle compared to 76.2 under the haul road option, resulting in a LOS C compared to a LOS F under the haul road option and delays at the eastbound intersection would increase to 13.6 seconds per vehicle compared to 18.4 under the haul road option, resulting in a LOS B compared to a LOS C under the haul road option.

In addition to peak hour delays during the construction seasons of years two through four, intermittent delays would be anticipated throughout each workday because traffic in both directions over the bridge at I-80 Exit 221 would be stopped periodically to allow over-width trucks hauling WTG components to

cross. WTG components would not be transported during peak traffic hours. Traffic also would be stopped where CR 401 (Sage Creek Road) intersects the internal haul road to allow trucks to cross CR 401 near the entrance to the western portion of the Sierra Madre site. PCW has proposed to station flaggers or explore the possibility of installing temporary traffic signals at these locations. Because all WTGs in the Sierra Madre site are scheduled to be constructed during the second year of construction, delays would not occur at this location during Years 3 and 4 of construction.

Based on the assessment provided in the PTMP, the principal transportation and access effects of Alternative 1R on public highways and roads would be localized in two areas: 1) the 3-mile segment of WY 76/CR 407 leading from the IRF access point to the internal haul road including the bridge over I-80 at Exit 221 and the I-80 westbound off ramp and eastbound on ramp at that exit; and 2) WY 71/CR 401. If the haul road workforce commuting option were to be selected, the only segment of WY 71/CR 407 anticipated to be affected would be the point where the internal haul road crosses CR 401 near the northern boundary of the Sierra Madre site.

These impacts would be greatest during the afternoon shift change of construction Year 1, when workforce commuting associated with two shifts would coincide. But, delays and reductions in LOS on WY 76 in the vicinity of I-80 Exit 221 would occur at the beginning and end of shifts during peak months of all four construction years and, given the substantial volumes of over-length, over-width and overweight truck traffic, hauling WTG components, intermittent delays could occur on this section throughout the peak months of the last three years of construction. Intermittent delays also could occur at the point where the internal haul road crosses CR 401 during the peak months of the first two work years to accommodate truck traffic

Other traffic delays and congestion would be limited to streets and key intersections within Rawlins during shift changes and these are anticipated to be relatively moderate. The temporary workforce anticipated to live in Rawlins would add to the everyday traffic volumes within that community but those volumes would be distributed primarily to commercial areas of the city and where temporary housing is located.

Peak hour transportation impacts would affect Sinclair residents, visitors, commerce associated with the Sinclair Refinery, the CIG compressor station and the truck stop on WY 76 south of I-80 Exit 221. It is likely that Sinclair residents who need to access I-80 for travel may opt to use I-80 Exit 219 west of Sinclair during peak hour periods.

Under either workforce commuting option, project-related traffic impacts could affect recreation visitors using WY 71/CR 401 to access BLM lands south of Rawlins or the western portion of the Medicine Bow National Forest during summer months of the first two construction years as a result of intermittent delays at the point where the internal haul road crosses CR 401. Some visitors may choose to use alternate routes during these periods.

Public safety effects on highways and roads providing access to the Application Area during construction would be associated with the high volumes of traffic including heavy and oversize trucks on the affected roadways and at access points to the project site. Special measures such as the installation of traffic signals or flaggers on the bridge over I-80 at Exit 221 and at the point where the internal haul road would cross CR 401could reduce traffic hazards in those areas. But the addition of the volumes of and types of traffic associated with Alternative 1R would increase the risk of accidents on affected highways and roads.

The segment of WY 76/CR 407 that would provide access to the project for all WTGs and construction materials would require a number of improvements to accommodate the large volumes of truck traffic and the oversize and overweight vehicles transporting WTGs. Similarly, the point where the internal haul road would cross CR 401 would require improvement. Additionally, highway and road damage on these segments would result from the large volume of heavy trucks and overweight trucks required to transport

WTGs, construction materials and heavy equipment. These highways and roads would require improvement before construction begins and repair after construction has been completed.

All construction related transportation impacts would be short-term and temporary in nature, occurring during April through October of each of the four construction years.

4.10.4 Operations

Operation and maintenance activities associated with Alternative 1R would require substantially less personnel than project construction and are anticipated to total 112 to 114 full-time, year round staff. The majority of operations and maintenance trips are anticipated to originate from the O&M facility on CR 407 (CIG Road) and access the project site over the internal haul road. The PTMP anticipates approximately 340 trips per day to and from the Application Area, with most these occurring in conjunction with the normal workday commuting. Although not estimated in the PTMP, intermittent maintenance trips would likely be associated with contract workers performing maintenance and repairs. The incremental traffic associated with project operations and maintenance would be substantially lower than construction related traffic and would be not anticipated to result in traffic delays or reduced LOS on the highway and road network providing access to the Application Area, with the exception of possible minimal and short-term delays on the segment of WY 76/CR 407 leading to the project access road.

4.10.5 Decommissioning and Final Reclamation

At the end of the project's anticipated 30-year life, or when it is determined that the project is no longer economical, the project would be decommissioned and the Application Area reclaimed. During decommissioning the WTGs would be removed as would the upper 2.5 feet of the foundations, the meteorological towers and the aboveground electrical network. Access roads would be reclaimed, at the discretion of the BLM and private landowner, and disturbed areas re-vegetated. Project decommissioning and final reclamation work is anticipated to occur from April through October over a 3-year period and require a peak of 370 employees. Similar equipment (cranes and earthmoving equipment) would be required for decommissioning and reclamation as would be required for project construction.

Traffic volumes would vary throughout the decommissioning/reclamation phase. Estimated peak month traffic volumes are shown in **Table 4.10-5**.

As shown in the **Table 4.10-5**, peak month daily trips would total 1,084. Of those, 68 percent would be passenger vehicle trips associated with workforce commuting, 10 percent would be trucks associated with the transport of WTG components, 15 percent would be associated with pilot cars and 6 percent would be other trucks.

Table 4.10-5 CCSM Peak Month Daily Decommissioning/Reclamation Trips

Daily Trips During Peak Decommissioning/Final Reclamation Month		
Vehicle Type	**Trips In**	**Trips Out**
Workforce Commuting	370	370
WTG Trucks	56	56
Pilot Cars	84	84
Other Construction Trucks	32	32
Subtotal	542	542
Total Daily Trips	1,084	

Source: PCW 2010b.

This level of traffic would be about half of that estimated for the peak construction months during construction Years 3 and 4. It is not possible to forecast conditions on affected highways and roads over 30 years in the future, so the impacts of decommissioning and reclamation cannot be assessed. The PTMP does not anticipate significant negative impacts on transportation and access conditions assuming similar conditions in the future. The PTMP also suggests that a transportation study would be completed prior to the decommissioning and reclamation process and that any damage to affected roadways and highways as a result of the decommissioning/reclamation process would need to be repaired.

4.10.6 Impacts to Transportation and Access from Alternative 2, Checkerboard Only

Alternative 2 considers wind development on public lands located within the Chokecherry site and those public lands located within the Sierra Madre site north of T18 N. Privately owned and state lands located in these areas also were considered available for development. As with Alternative 1R, Alternative 2 would involve the construction, operation and decommissioning of 1,000 WTGs and associated access roads, power collection and transmission lines, substations and an interconnection line.

Project access would remain the same under Alternative 2. Although the total number of WTGs would be unchanged as compared to the Proposed Action, implementation of Alternative 2 would require construction of additional internal resource roads, turnarounds, and a more extensive energy collection system, increasing the workforce and the total amount of materials, equipment, and supplies deliveries for construction. The critical implication of these differences would be the increase in project-related traffic volume during construction. It is unclear whether the differences would result in a higher peak workforce in Year 1, more traffic during Year 1 but not affecting the peak, be spread out over Years 2 through 4, or some combination of these three scenarios. An increase in peak traffic would exacerbate some of the traffic impacts described above, whereas spreading the additional effort over Years 2 through 4 would result in more traffic volume, and more frequent and/or extended duration of high volume effects on traffic, but within the basic parameters outlined for Alternative 1R.

The trips required during project operations and decommissioning would remain the same as those associated with Alternative 1R. However the distribution of WTGs would be different, as Alternative 2 contemplates that 59 percent of total WTGs would be located in the Chokecherry site (compared to 53 percent under Alternative 1R) and 41 percent would be located in the Sierra Madre site (compared to 47 under Alternative 1R). Within the Sierra Madre site, the location of the WTGs under Alternative 2 also would change. Within Sierra Madre, 54 percent of the WTGs would be located west of WY 71/CC 401 (compared to 62 percent under Alternative 1R) and 46 percent would be located east of WY 71/CC 401 (compared to 38 percent under Alternative 1R).

Under the haul road workforce commuting option, the effects of the Alternatives 1R and 2 on the access roads leading to the Application Area would be similar, with the exception that there could be a decrease in construction, operations and decommissioning traffic in the western portion of the Sierra Madre site compared to Alternative 1R, due to the reduction in WTGs that would be located in that area. This would result in a corresponding reduction in vehicles crossing CR 401 (Sage Creek Road) at its intersection with the internal haul road, which would mean fewer delays at that intersection during construction months of the 2 years when road and WTG construction would occur in the Sierra Madre site.

Under the WY 71/CR 401 workforce commuting alternative, the 13 percent reduction in the number of overall WTGs in the Sierra Madre site would correspondingly reduce the number of workforce commuting trips on that route. This could reduce peak month/peak hour congestion on the route depending on PCWs construction schedule.

As with Alternative 1R, the configuration of internal access roads and the related traffic and safety effects would be addressed in the Traffic Management Plan that would be submitted by PCW prior to the initiation of construction.

If the WY 71/CR 401 workforce commuting option were to be selected, project-related traffic volumes on I-80 and within the City of Rawlins would be somewhat different than those forecast in the PTMP for Alternative 1R. Fewer overall workforce commuting trips would be destined to the Sierra Madre site, which could result in reductions in peak hour traffic volumes on streets and intersections providing access to WY 71/CR 401 compared to Alternative 1R, depending on PCW's construction schedule. However, streets and intersections providing access to I-80 east for access to WY 76/CR 407 would see increases in peak/hour volume compared to Alternative 1R to account for the higher numbers of workforce commuting trips destined to the Chokecherry site. These differences would likely not substantially alter conclusions about delay and reductions in LOS within Rawlins described under Alternative 1R.

Similar to Alternative 1R, the highway and road segments providing access to the project for WTGs and construction materials would require improvement before construction begins and repair after construction has been completed. Highway and road improvements and repair likely also would be required prior to and at the conclusion of decommissioning.

Traffic volumes and patterns associated with Alternative 2 operation and maintenance activities would be comparable to those under Alternative 1R, with the majority of trips anticipated to originate at the O&M facility on CIG Road and access the project site over the internal haul road. Based on these similarities and the conclusions in the PTMP, the traffic associated with project operations under Alternative 2 would be anticipated to result in similar effects on highways, roads and key intersections as would occur under Alternative 1R.

At the end of the project's anticipated 30-year life, or when it is determined that the project is no longer economical, the project would be decommissioned and the Application Area reclaimed. Traffic associated with decommissioning and reclamation under Alternative 2 would be comparable to that under Alternative 1R, occurring in late summer to early fall. Heavy equipment similar to that used during project construction would be required for decommissioning and reclamation. Transportation impacts of decommissioning cannot be forecast at this time, but a transportation study would be prepared prior to decommissioning.

4.10.7 Impacts to Transportation and Access from Alternative 3, No Miller Hill or Sierra Madre

Alternative 3 considers development of 1,000 WTG on public lands within the Chokecherry site and within the Sierra Madre site east of the eastern half of T18N, R88W. Privately owned and state lands located in these areas also were considered available for development. All lands (public, state, and private) below T18N or in the western half of T18N, R88W21 are excluded from wind development under Alternative 3.

The distribution of WTGs that would be located in each site under Alternative 3 would be substantially different compared to the distribution under Alternative 1R. Under Alternative 3, 66 percent of total WTGs would be located in the Chokecherry site (compared to 53 percent under Alternative 1R) and 34 percent would be located in the Sierra Madre site (compared to 47 under Alternative 1R). Within the Sierra Madre site, the location of the WTGs under Alternative 3 also would change with 40 percent of the WTGs in the Sierra Madre area located west of WY 71/CC 401 (compared to 62 percent under Alternative 1R) and 60 percent would be located east of WY 71/CC 401 (compared to 38 percent under Alternative 1R).

Although the total number of WTGs would be unchanged as compared to the Alternative 1R, implementation of Alternative 3 would require construction of additional internal resource roads, turnarounds, and a more extensive energy collection system, increasing the workforce and the total amount of materials, equipment and supplies deliveries for construction. The critical implication of these differences would be the increase in project-related traffic volume during construction. It is unclear

whether the differences would result in a higher peak workforce in Year 1, more traffic during Year 1 but not affecting the peak, be spread out over Years 2 through 4, or some combination of these three scenarios. An increase in peak traffic would exacerbate some of the traffic impacts described above, whereas spreading the additional effort over Years 2 through 4 would result in more traffic volume, and more frequent and/or extended duration of high volume effects on traffic, but within the basic parameters outlined for Alternative 1R.

Under the haul road workforce commuting option, effects on project access routes under Alternative 3 would be similar to those associated with Alternative 1R, except that delays and reductions in LOS at the point where the haul road crosses CR 401 (Sage Creek Road) would be substantially reduced compared to Alternative 1R as a result of the reduction in truck trips required to construct fewer WTGs in the western portion of the Sierra Madre site.

If the WY 71/CR 401 workforce commuting option is selected, there would substantially fewer trips required to service the reduced numbers of WTGs in the Sierra Madre site.

Within the Rawlins, traffic effects would be similar to Alternative 1R under the haul road workforce commuting option. Under the WY 71/CR 401 workforce commuting option, fewer trips would be required on WY 71/CR 401, potentially reducing peak hour congestion, delay and reductions in LOS at intersections providing access to that route, depending on the construction schedule. Correspondingly more trips would be required to access the Application Area via the internal haul road so increases in congestion, delay and reductions in LOS at intersections providing access to I-80 east would be greater than Alternative 1R under this workforce commuting option, depending on the construction schedule.

As with Alternative 1R, the configuration of internal access roads and the related traffic and safety effects would be addressed in the Traffic Management Plan that would be submitted by PCW prior to the initiation of construction.

Similar to Alternative 1R, the highway and road segments providing access to the project for WTGs and construction materials would require improvement before construction and decommissioning begins and repair after construction and decommissioning has been completed.

Long-term transportation effects associated with operations and maintenance, as well as the eventual decommission and reclamation under Alternative 3 would essentially be the same as under Alternative 1R.

4.10.8 Impacts to Transportation and Access from Alternative 4, Private Lands Only

Alternative 4 considers placement of WTGs on private lands only within both the Chokecherry and Sierra Madre sites. A total of 846 WTGs would be developed compared to 1,000 under Alternative 1R and approximately 66 percent of the total would be developed in the Chokecherry site and 34 percent in the Sierra Madre site.

The number of WTGs located west of WY 71/CR 401 in the Sierra Madre area would be reduced by almost 48 percent under Alternative 4 compared to Alternative 1R, substantially reducing delays at the point where the internal haul road would cross CR 401 (Sage Creek Road) under Alternative 4 compared to Alternative 1R.

Reducing the number of WTGs, while at the same time increasing the amount of resource road construction, likely would translate to a net reduction in direct construction labor and lower total project construction cost. The net labor requirement would likely not be substantially different from the total under Alternative 1R. Although the net total labor required may be lower, it does not follow that the reduction in direct labor requirement would result in a lower overall traffic volume, as the increase in road construction could result in a higher peak workforce in Year 1, or alternatively, the additional effort could

be spread over several years. Similarly, the reduction in construction effort associated with WTG construction and commissioning could be spread out over Years 2 through 4, or occur primarily in Year 4. An increase in peak traffic would exacerbate some of the traffic impacts described above, whereas spreading the additional effort over Years 2 through 4 would result in more traffic volume, and more frequent and/or extended duration of high volume effects on traffic, but within the basic parameters outlined for Alternative 1R. Because these two factors have offsetting tendencies, the net effects on traffic volume, delays and LOS at the key access locations addressed in the TMP, are unclear. However, estimates of the net effects on labor derived from projections for Alternative 1R suggests that the net effect on project-related trips on I-80 and at the intersections at I-80 Exit 221 providing access to WY 76/CR 407 and the internal haul road would not differ substantially from those forecast in the PTMP for Alternative 1R. Overall traffic volumes within the City of Rawlins likely also would be similar.

As with Alternative 1R, the configuration of internal access roads and the related traffic and safety effects would be addressed in the Traffic Management Plan that would be submitted by PCW prior to the initiation of construction.

Similar to Alternative 1R, the highway and road segments providing access to the project for WTGs and construction materials would require improvement before construction and decommissioning begins and repair after construction and decommissioning has been completed.

Long-term transportation effects associated with O&M, as well as the eventual decommissioning and reclamation under Alternative 3 would lower than those associated with Alternative 1R, because of there would be 15 percent fewer WTGs and ancillary facilities requiring maintenance and decommissioning.

4.10.9 Mitigation

The assumptions listed at the beginning of Section 4.10, Transportation, include a number of safety, highway and road enhancement and restoration measures that are included in the PCW PTMP. The following additional measures are proposed to mitigate the effects of Alternative 1R on area transportation and access.

GEN-1: Four separate ROW grants would be issued as part of Phased Construction Sequencing. The sequencing is designed to limit disturbance to the area anticipated to be developed within the following 12 months.

Effectiveness: Implementation of this measure would effectively result in project development occurring over five construction seasons, rather than the four seasons included under the PCW's POD and the action alternatives. The net effect of the proposed ROW phasing would be to redistribute and extend the employment and related effects on transportation over 5 years, resulting in lower peak employment and associated effects on congestions, delays and levels of service, as compared to the corresponding metrics under Alternative 1R. At the same time, temporary employment and related effects on transportation systems would be extended by a year, and would be higher than projected in the final year under Alternative 1R.

TRANS-1: PCW shall participate in a coordinated transportation planning process with the BLM, WYDOT, Carbon County, the Town of Sinclair, the Sinclair Refinery, the CIG compressor station, the City of Rawlins, affected grazing operators, and other major property owners (including the operator of the truck stop just north of I-80 Exit 221) in the affected area, to identify and develop measures to avoid, manage or mitigate transportation impacts of construction. The group shall meet prior to and during the construction phase of the project and in the initial year of project operations, as needed.

TRANS-2: PCW shall develop measures to inform and update Carbon County residents and travelers on I-80 near Sinclair and WY 71 about potential delays during peak months and especially during peak hours. In coordination with WYDOT, electronic signage shall be used near I-80 Exit 221 to encourage I-80 travelers to use alternate access to Sinclair during peak hours.

TRANS-3: PCW shall coordinate with WYDOT to identify measures to control traffic and enhance traffic flows in the vicinity of I-80 Exit 221 during shift changes and at times when oversized vehicles will be crossing the bridge over I-80.

TRANS-4: PCW shall implement incentives for carpooling and/ or other workforce transportation measures to reduce traffic and congestion during shift changes.

Effectiveness: Given the large volumes of traffic anticipated under Alternative 1R during peak months and during peak traffic hours, congestion, delay, and deteriorations in LOS on certain highways and roadways and at certain key intersections and increased risk of accidents are inevitable. Additionally, the large numbers of trucks including overweight trucks would result in damage to the route from the IRF to the internal haul road and at the point where the internal haul road would cross CR 401 (Sage Creek Road). If diligently implemented, the mitigation measures listed above, along with performance of the safety, highway and road enhancement and restoration measures listed as assumptions at the beginning of this section could effectively avoid, manage, and mitigate potential adverse transportation effects of project construction.

4.10.10 Residual Impacts

Residual long-term transportation impacts associated with Alternative 1R and action alternatives during operations would include minor incremental contributions to local traffic volumes, contributing to congestion, delay and deteriorations in LOS on certain highways and roadways and at certain key intersections. The key roads and highways used by operations traffic would be subject to accelerated wear, requiring additional maintenance effort and outlays. Residual risks of traffic accidents and associated property damage, injuries and fatalities would be higher than under the No Action Alternative, due to the increased traffic volume. Residual effects would be anticipated during project decommissioning.

4.10.11 Irreversible and Irretrievable Commitment of Resources

At the conclusion of decommissioning, project roads and access points would be reclaimed at the discretion of the BLM and the landowner. Consequently, some internal project roads could remain in place after decommissioning and reclamation. However, the continued existence of such roads would not represent irreversible and irretrievable commitments of resources because they could be abandoned and reclaimed at a later date.

4.10.12 Relationship between Local Short-term Uses and Long-term Productivity

Short-term increases in traffic with associated delays and reductions in LOS on roads and at key intersections providing access to the Application Area could temporarily impede and delay other commercial and industrial traffic on these roads and intersections. Such delays would likely be minimal for most users of these routes and result in minimal effects on short term use and long term productivity.

4.11 Impacts to Vegetation

This section is discussed in three distinct subsections: vegetation, noxious and invasive species, and wetlands and riparian zones.

4.11.1 Vegetation

This section describes the impacts to vegetation that would result from the proposed project. Impacts to vegetation would occur over a large area but would constitute a small percentage of the overall Application Area. Impacts to vegetation are primarily related to the direct removal of vegetation associated with grading of roads, pads, and staging areas for the development of the project. Other impacts may include plant mortality and lower reproduction as a result of construction dust that could impair photosynthesis and plant respiration as well as inhibit pollination. Loss of vegetative cover would be temporary in nature and would either recover naturally from adjacent seed sources or through reclamation following construction. Impacts to vegetation associated with each of the project alternatives are described in the remainder of this section.

The Analysis Area for vegetation consists of the Application Area and those features that fall outside of the Application Area such as roads, transmission lines, connector poles, etc. The Application Area includes 222,689 acres. Impacts to vegetation were determined by overlaying the alternatives on vegetation mapping (presented in Section 3.11, Vegetation) and calculating both initial and long-term impacts using GIS.

4.11.2 Noxious Weeds and Invasive Species

Impacts from noxious weeds and invasive species are expected to be relatively minor, especially with diligence in preventing the importation and spread of weed seed into the Application Area and timely treatment once weeds are detected. Precautionary actions such as vehicle washing and intensive reclamation efforts would prevent weeds from gaining a foothold in newly disturbed areas. Impacts from noxious weeds and invasive species are difficult to quantify, since comprehensive inventories were not conducted and the spread and establishment of these species is highly dependent upon potential invasion sites created by soil disturbance and the diligence of the applicant and their contractors. In addition to the amount of disturbed area, roads provide linear corridors where vehicles, people, wildlife, livestock, wind, and water can carry weed seed and weeds can become established. Disturbance prone species, such as halogeton, could spread more easily in the newly disturbed areas, especially along linear disturbances such as access roads. In addition, road edges tend to receive the most constant disturbance from run-off and vehicles pulling off and parking along the edge. Measures to address the spread of weeds within the Application Area, including those discussed above, are currently being developed in the Reclamation Plan. Upon project approval, measures to control the spread of weeds contained in these plans will be implemented by the applicant.

4.11.3 Wetlands and Riparian Zones

Wetlands and associated riparian zones would be impacted by the filling of their drainages and associated wetlands and riparian zones at road crossings of perennial and ephemeral drainages. In addition, surface flows would be diverted and concentrated into culverts and surface runoff is likely to increase due to increased impervious surfaces such as roads, turbines, and facilities and the concentration of that water to new areas.

Issues/concerns that were raised during project scoping or cooperating agency meetings and documented in the project *Scoping Summary Report (*BLM 2009c) related to wetlands include:

- Waterbodies and groundwater resources that will be impacted should be clearly described;

- Mitigation commitments that include the indirect draining of, or direct disturbance of, wetland areas should be avoided if at all possible, and complete avoidance of disturbance to any fen wetlands (EO 11990);
- Recommendation that bridges be used over perennial streams during construction; and
- Conduct a comprehensive analysis of all drainages that are near or intersecting road crossings and staging areas.

4.11.4 Issues and Management Considerations

Balancing the conflict between managing and maintaining quality vegetation resources and allowing consumptive uses is one of BLM's primary management considerations (BLM 2008a). Vegetation resource values include watershed and riparian protection, soil stabilization, maintenance, and enhancement of wildlife habitat. Consumptive uses include livestock and wildlife grazing; forest management; OHV use; vegetation removal by mineral development; ROW construction; and other surface disturbing activities.

This project would have surface disturbing activities that fall into two categories, initial and long-term. Initial impacts are those impacts to vegetation that are related to initial grading, construction, and installation such as wind turbine generators, staging areas, road cuts and fills, lay down areas, and other remedial grading. These areas would be reclaimed following disturbance and returned to a condition that currently exists within 5 to 10 years following installation of the project. Long-term impacts are those impacts associated with features used for O&M of the project that would not be reclaimed until after the project is decommissioned at the end of the project's life. Long-term impacts include roads, turbine pads, substations, connector poles, etc. The BLM's management goals, objectives, and actions for managing for vegetation and consumptive uses are listed in **Table 4.11-1** (BLM 2008a).

Table 4.11-1 Relevant Management Considerations for Vegetation

BLM RMP and ROD – Vegetation
Management Goals • Manage vegetation to achieve and maintain proper ecosystem function. • Manage vegetation communities to restore, maintain, or enhance vegetation community health, composition, and diversity to benefit multiple resources and their uses, consistent with site potential. • Manage to protect, preserve, or enhance Special Status Plant Species (T&E and BLM State Sensitive plant species) and unique plant communities. • Manage to control noxious and invasive species. • Manage aspen communities for a healthy mix of successional stages within a natural range of variation.
Management Objectives • Maintain, restore, and enhance vegetation communities to facilitate a healthy mix of successional stages (identified in activity plans) that incorporate age class, structure, and species composition into each vegetation type, consistent with site potential. • Control the introduction and proliferation of noxious and invasive species and reduce established populations to acceptable levels determined through cooperation, consultation, and coordination with local, state, other federal plans, policies, and agency agreements. • Maintain, restore, and enhance the health and diversity of plant communities through the use of management prescriptions (such as prescribed natural fire, burning, plantings, seedings, and chemical, mechanical, biological, and grazing treatments or other treatments) in coordination with local, state, and federal management plans and policies. • Maintain, restore, and enhance riparian, wetland, and upland vegetation to meet the Wyoming Standards for Healthy Rangelands.

Table 4.11-1 Relevant Management Considerations for Vegetation

BLM RMP and ROD – Vegetation
• Maintain, restore, and enhance aspen communities (BLM 2008a, RMP, Appendix 19). • Maintain, restore, and enhance Special Status Plant Species (T&E and BLM State Sensitive plant species) and unique plant communities. • Utilize inventory and monitoring data to support vegetation management. • Maintain connectivity between large contiguous blocks of public land by minimizing fragmentation of vegetative communities.
Management Actions • Forage allocation on acquired lands will be consistent with the purpose of the acquisition and multiple-use objectives for the area. • All forms of control for noxious and invasive species are allowed in the Application Area on a case-by-case basis (BLM 2008a, RMP, Appendix 19). • Minimize disturbance to vegetation through application of BMPs; mitigation, as appropriate and practical (BLM 2008a, RMP, Appendices 13, 14, 15, and 19); and reclamation practices (BLM 2008a, RMP, Appendix 36). • Reclaim disturbed areas in accordance with BLM State Reclamation Policy (BLM memorandum 2009-022). • Manage riparian, wetland, and upland vegetation to meet the Wyoming Standards for Healthy Rangelands. • Maintain, restore, and enhance riparian, wetland, and upland vegetation to meet the Wyoming Standards for Healthy Rangelands RMP (BLM 2008a, RMP, pg 2-93). • The BLM RMP stipulates that no surface disturbance may occur within 500 feet of surface water or riparian areas (BLM 2008a, RMP, pg 2-99).

Source: Proposed RMP, Final EIS for the RFO, Chapter 2, Table 2-1, pp 2-93 through 2-99 (BLM 2008a).

4.11.5 Assumptions

The following assumptions were used in the analysis for vegetation resources:

- Turbine locations are conceptual and subject to change after the ROD is issued.
- The assessment is being completed at a hybrid or programmatic level. Additional NEPA analysis will be necessary for all project components after the ROD is issued. One outcome of the hybrid approach is to better define the resource constraints, standard practices, and mitigation measures that all future NEPA analyses will depend on.
- Vehicle washers would be used to minimize the importation and spread of weeds within the Application Area.
- Reclamation of short-term impacts to vegetation would be initiated during the first year after construction and that soil disturbance will be successfully reclaimed within 5 to 10 years.
- Disturbance to cushion vegetation communities (not mapped) occurring along the edge of many of the rocky cliffs would be avoided to the extent practical.

The evaluation assumes that ACMs and BMPs would be successfully implemented. According to the applicant's POD, operators would maintain and monitor vegetation mitigation measures for the approved project in accordance with a Reclamation Plan and Environmental Compliance Plan.

4.11.6 Significance Criteria

Impacts on vegetation would be considered potentially significant (BLM 2008a) if the following occurred:

- Any action or event that would remove a community's unique attributes or ability to support other resource values within the planning period, or if corrective actions were beyond the scope of this document.
- The viability of protected plant species is jeopardized, with little likelihood of reestablishment after disturbance, or actions result in the need to list a species under the ESA.
- Actions that have the potential to remove sensitive plant species or substantially alter the habitat's ability to support the species.
- Reclaimed areas do not attain adequate vegetation groundcover and species composition to stabilize the site within 5 years from disturbance, or there is invasion and establishment of noxious or invasive weeds that contribute to unsuccessful revegetation.
- Introduction of noxious and invasive weeds into areas considered weed-free, or an increase in weeds where they already exist.
- Impact to unique communities such as cushion plants could be permanent unless successful restoration techniques are developed.
- Any unmitigated loss of wetlands or wetland function (EO 11990 and EO 11988) or activities that would degrade wetland/riparian areas such that PFC Standards for Healthy Rangelands (BLM 1997a) is not maintained.

4.11.7 No Action Alternative

4.11.7.1 Impacts to Vegetation

Under the No Action Alternative, there would be no anticipated impacts beyond existing conditions to vegetation as the proposed project would not be developed. Under this alternative, the BLM would prohibit development on its lands, as well as access to private lands for wind energy projects. Furthermore, the State of Wyoming would restrict development on private and state lands in the Application Area. The combined result of these restrictions would prohibit the development of the project in the Application Area. Already established weeds and rates of weed expansion and control would continue at the same rate if the proponent elects not to construct the project.

4.11.7.2 Impacts from Noxious Weeds and Invasive Species

Under the No Action Alternative, there would be no anticipated impacts resulting from the creation of newly disturbed soils and the importation and spread of weeds. The weeds already present would continue to persist and control would continue using existing ranch operations and RMP policies. However, those existing weed populations may not get as much management attention due to their remote locations and limited access by land managers.

4.11.7.3 Impacts to Wetlands and Associated Riparian Zones

Under the No Action Alternative, no additional impacts would occur to wetlands and riparian zone drainages and any development would be limited to existing authorizations.

4.11.8 Alternative 1R, Applicant Proposed Alternative

4.11.8.1 Impacts to Vegetation

Impacts to vegetation would occur from the construction (initial disturbance), operation (long-term disturbance), and decommissioning (temporary disturbance) of this alternative. Alternative 1R would

result in direct impacts to 7,221 acres of vegetation within the CCSM areas. Following reclamation, Alternative 1R would result in 1,544 acres of long-term impacts within the CCSM areas. The dominant vegetation types impacted include mountain big sagebrush and Wyoming big sagebrush with initial impacts of 4,169 and 1,358 acres, respectively. Long-term impacts to mountain big sagebrush would be 795 acres and Wyoming big sagebrush would be 261 acres. Saltbush is the next most common vegetation type with a total of 990 acres of initial disturbance and 227 acres of long-term disturbance following reclamation. Direct impacts associated with Alternative 1R are shown on **Figure 4.11-1** and in **Table 4.11-2**.

Heavy equipment used to construct the roads and grade the pads would likely generate an extensive amount of dust that would temporarily affect adjacent vegetation. McCrea (1984) notes that roadside dust causes reduced photosynthesis, leading to the loss of plant yield, and hindering of the pollination of small seeded fruit by insects, thus reducing effective fertility. Indirect impacts to vegetation as a result of dust are likely temporary in nature and would likely only affect adjacent vegetation during construction and heavy road use until it can be washed off by rain or other means. If plant mortality does occur, vegetation would be restored through natural regeneration or reclamation efforts.

Impacts resulting from the decommissioning of the project (temporary disturbance) have the potential to occur and would be similar to impact levels resulting from project construction. Decommissioning impacts would include direct impacts resulting from staging area use and increased dust levels due to increased traffic levels.

4.11.8.2 Impacts from Noxious Weeds and Invasive Species

Under Alternative 1R, a total of 7,221 acres of soil would be disturbed. Soil disturbance creates an opportunity for existing weeds to spread and other weed species to become established. Once the short-term impact areas are revegetated, approximately 1,544 acres would remain that are susceptible to invasion by weeds, including areas at the base of power poles, turbine sites, road shoulders, etc. In addition, the 368 miles of newly constructed roads would provide a corridor in which weed seeds can be transported and the edge along reclaimed areas provide good sites for weeds to become established. Although Alternative 1R is the smallest and most compact action alternative, this alternative would impact areas with little previous disturbance such as Miller Hill and the Sierra Madre that are relatively weed free. Direct impacts associated with the introduction and spread of noxious weeds and invasive species would be mitigated through the implementation of the BLM-approved Reclamation Plan. **Figure 4.11-2** shows the noxious and invasive species weeds in the vicinity of Alternative 1R. A summary of potential disturbance acreage for Alternative 1R is provided in **Table 4.11-2**.

Impacts resulting from the decommissioning of the project (temporary disturbance) have the potential to occur and would be similar to impact levels resulting from project construction. Decommissioning impacts would include creating additional opportunities for noxious and invasive weeds to become established and spread.

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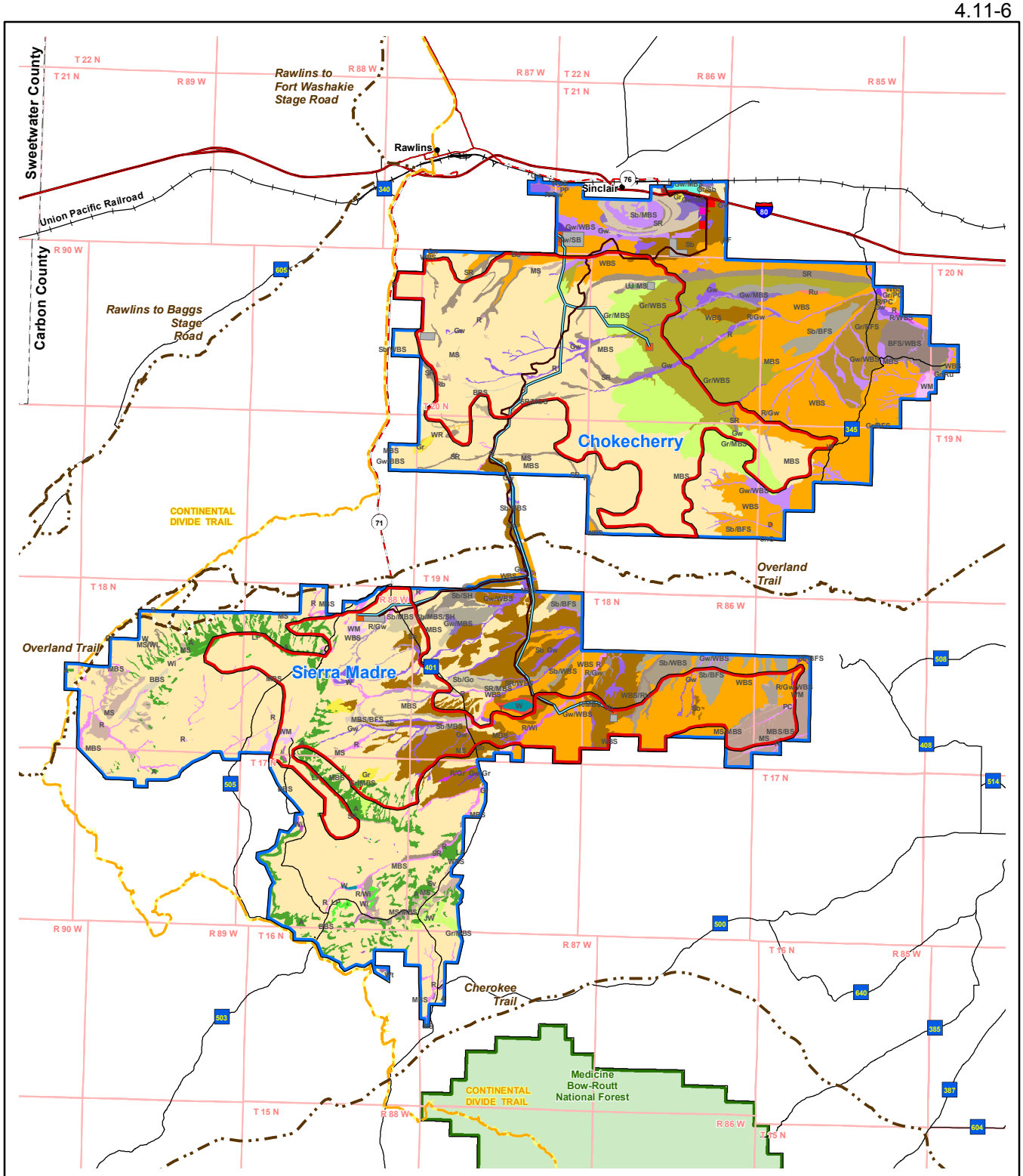

Project Area
Likely Area of Turbine Construction
Transmission Line
Haul Road

Project Facilities
- Alternate O&M Facility
- Intermodal Rail Facility
- Staging Area (Construction Only)
- Substation

Vegetation Classification
- Aspen (A)
- Juniper Woodland (JW)
- Limber Pine (LP)
- Plains Cottonwood (PC)
- Utah Juniper (UJ)
- Basin Big Sagebrush (BBS)
- Bird's Foot Sagebrush/ Wyoming Big Sagebrush (BFS/WBS)
- Black Sagebrush (BS)
- Mixed Shrub (MS)
- Mixed Shrub/ Mountain Big Sagebrush (MS/MBS)
- Mixed Shrub/ Wetland (MS/WL)
- Mountain Big Sagebrush (MBS)
- Mountain Big Sagebrush/ Bird's Foot Sagebrush (MBS/BFS)
- Mountain Big Sagebrush/ Black Sagebrush (MBS/BS)
- Rabbitbrush (Rb)
- Saltbush (Sb)
- Saltbush/ Goldenweed (Sb/Go)
- Saltbush/ Bird's Foot Sagebrush (Sb/BFS)
- Saltbush/ Mountain Big Sagebrush (Sb/MBS)
- Saltbush/ Mountain Big Sagebrush/ Spiny Horsebrush (Sb/MBS/SH)
- Saltbush/ Wyoming Big Sagebrush (Sb/WBS)
- Saltbush/ Spiny Horsebrush (Sb/SH)
- Serviceberry (Sv)
- Steep/ Rocky/ Mountain Big Sagebrush (SR/MBS)
- Steep/ Rocky/ Wyoming Big Sagebrush (SR/WBS)
- Steep/ Rocky (SR)
- Wyoming Big Sagebrush (WBS)
- Wyoming Big Sagebrush/ Rabbitbrush (WBS/Rb)
- Greasewood (Gw)
- Greasewood/ Basin Big Sagebrush (Gw/BBS)
- Greasewood/ Grassland (Gw/Gr)
- Greasewood/ Mountain Big Sagebrush (Gw/MBS)
- Greasewood/ Saltbush (Gw/Sb)
- Greasewood/ Wyoming Big Sagebrush (Gw/WBS)
- Alkali Flat (AF)
- Grassland (Gr)
- Grassland/ Bird's Foot Sagebrush (Gr/BFS)
- Grassland/ Mountain Big Sagebrush (Gr/MBS)
- Grassland/ Ruderal (Gr/Ru)
- Grassland/ Plains Cottonwood (Gr/PC)
- Grassland/ Saltbush (Gr/Sb)
- Grassland/ Wyoming Big Sagebrush (Gr/WBS)
- Wild Rye (WR)
- Riparian (R)
- Riparian/ Grassland (R/Gr)
- Riparian/ Greasewood (R/Gw)
- Riparian/ Greasewood/ Wyoming Big Sagebrush (R/Gw/WBS)
- Riparian/ Mountain Big Sagebrush (R/MBS)
- Riparian/ Plains Cottonwood (R/PC)
- Riparian/ Willow (R/Wi)
- Riparian/ Wyoming Big Sagebrush (R/WBS)
- Wetland (Wt)
- Wet Meadow (WM)
- Willow (Wi)
- Cheatgrass (ChG)
- Ruderal (Ru)
- Tamarisk (T)
- Water/ Ruderal (W/Ru)
- Developed (D)
- Water (W)

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.11-1

Map of Vegetation Impacts Associated with Alternative 1R

0 1 2 4 Miles
0 2 4 8 Kilometers
1:320,000
N

Table 4.11-2 Direct Vegetation Impacts Associated with Alternative 1R

Vegetation Community	Chokecherry		Sierra Madre		Total	
	Initial Disturbance (acres)	Long-term Disturbance (acres)	Initial Disturbance (acres)	Long-term Disturbance (acres)	Initial Disturbance (acres)	Long-term Disturbance (acres)
Mountain Big Sagebrush						
Grassland/Mountain Big Sagebrush	338	64	2	0	340	65
Mixed Shrub/Mountain Big Sagebrush	-	-	15	3	15	3
Mountain Big Sagebrush	2,164	416	1,448	270	3,612	686
Mountain Big Sagebrush/Bird's Foot Sagebrush	-	-	8	2	8	2
Mountain Big Sagebrush/Black Sagebrush	-	-	146	29	146	29
Steep/Rocky/Mountain Big Sagebrush	3	1	45	9	48	10
Mountain Big Sagebrush Subtotal	**2,505**	**481**	**1,664**	**313**	**4,169**	**795**
Saltbush						
Grassland/Saltbush	56	54	-	-	56	54
Saltbush	297	45	506	101	803	147
Saltbush/Bird's Foot Sagebrush	-	-	53	11	53	11
Saltbush/Goldenweed	-	-	7	1	7	1
Saltbush/Mountain Big Sagebrush	9	1	19	4	28	5
Saltbush/Spiny Horsebrush	3	1	15	3	18	4
Saltbush/Wyoming Big Sagebrush	-	-	25	5	25	5
Saltbush Subtotal	**365**	**101**	**625**	**125**	**990**	**227**
Wyoming Big Sagebrush						
Grassland/Wyoming Big Sagebrush	353	83	-	-	353	83
Wyoming Big Sagebrush	422	65	581	113	1,004	178
Wyoming Big Sagebrush/Rabbitbrush	-	-	1	0	1	0
Wyoming Big Sagebrush Subtotal	**775**	**148**	**582**	**113**	**1,358**	**261**

Table 4.11-2 Direct Vegetation Impacts Associated with Alternative 1R

Vegetation Community	Chokecherry		Sierra Madre		Total	
	Initial Disturbance (acres)	Long-term Disturbance (acres)	Initial Disturbance (acres)	Long-term Disturbance (acres)	Initial Disturbance (acres)	Long-term Disturbance (acres)
Other						
Aspen	-	-	41	8	41	8
Basin Big Sagebrush	2	0	-	-	2	0
Black Sagebrush	9	2	-	-	9	2
Developed	24	6	-	-	24	6
Grassland	5	1	17	3	22	5
Greasewood	23	5	31	6	54	11
Greasewood/Mountain Big Sagebrush	168	167	-	-	168	167
Greasewood/Saltbush	218	50	-	-	218	50
Greasewood/Wyoming Big Sagebrush	74	7	4	1	77	8
Mixed Shrub	62	8	11	2	72	10
Rabbitbrush	1	0	-	-	1	0
Riparian	5	2	25	4	30	5
Riparian/Greasewood	22	0	16	3	18	4
Riparian/Greasewood/Wyoming Big Sagebrush	-	-	1	0	1	0
Riparian/Mountain Big Sagebrush	-	-	1	0	1	0
Steep/Rocky	31	8	-	-	31	8
Utah Juniper	7	1	-	-	7	1
Wet Meadow	-	-	16	3	16	3
Wild Rye	2	0	-	-	2	0
Other Subtotal	**653**	**257**	**163**	**30**	**794**	**288**

Note: GIS estimates use assumed component locations to generate disturbance associated with vegetation type. While these estimates may vary somewhat from disturbance estimates that were generated by assuming an average amount of disturbance associated with each project component proposed by alternative (as presented in Chapter 2.0), the difference is estimated to be less than 5 percent.

Source: AECOM 2009; PCW 2008b.

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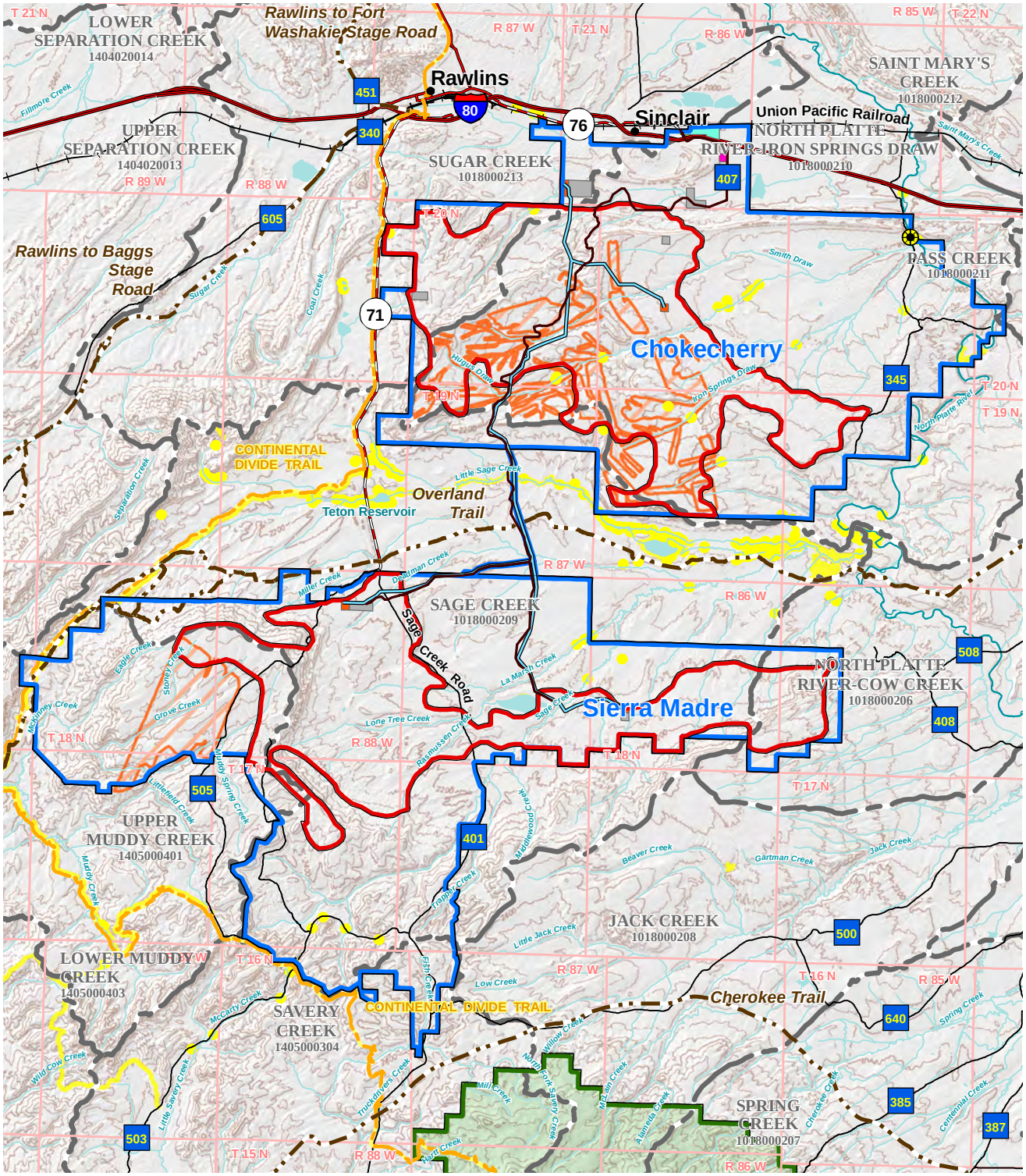


Legend

- Water Extraction Site
- Haul Road
- Transmission Line
- Alternate O&M Facility
- Intermodal Rail Facility
- Staging Area (Construction Only)
- Substation
- Project Area
- Likely Area of Turbine Construction
- Spike Treatment for Sagebrush Enhancement
- Noxious Weed Location (Not to Scale)
- National Forest
- Interstate Highway
- U.S. Highway
- State Highway
- Continental Divide Trail
- Historic Trail
- River or Creek
- Lake or Reservoir
- Watershed Boundary

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.11-2

Map of Known Noxious and Invasive Weeds in Vicinity of Alternative 1R

0 1 2 4 Miles
0 1 2 4 Kilometers
1:300,000
N

4.11.8.3 Impacts to Wetlands and Associated Riparian Zones

Under Alternative 1R, wind development would be authorized in the alternative area within the TOTCO ranch boundaries. **Figure 4.11-3** shows the wetland and associated riparian zones within Alternative 1R. Impacts to wetlands and riparian zone drainages would occur from the construction footprint during the initial disturbance, operation (long-term disturbance), and decommissioning (temporary disturbance) of this alternative. Initial impacts for wetland and riparian zone drainages would consist of the same features as discussed in Section 4.11.8.1, Impacts to Vegetation (e.g., roads, turbines, staging areas, collection poles, turnarounds, etc.). Unlike the upland vegetation, all of the impacts to wetlands and riparian areas would be long-term with the exception of transmission lines. It is assumed that during construction, culverts will be placed in drainages prior to construction fill and surface hydrology is no longer available to support wetlands and riparian zones at these locations until the fill and culverts are removed following decommissioning.

It is anticipated that impacts would occur due to construction of project features, such as roads and transmission lines, which cross wetlands. The types of impacts that could occur include the following:

- Direct loss of wetland habitat due to project infrastructure;
- Alteration of the hydrologic processes due to project infrastructure or soil compaction; and
- Altered surface runoff patterns (collection, concentration, and conveyance)

The majority of disturbance would occur in drainages that would be crossed by roads and transmission lines associated with the project. The transmission line disturbances are expected to be temporary disturbances. The linear feet of potential disturbance was calculated using the conceptual layout of the alternative and overlaying it onto the wetland and associated riparian zone data developed, as described in Section 3.11.3, Vegetation. Alternative 1R would result in the initial impact to wetlands and riparian zones associated with 18,421 linear feet of drainage. These impacts include 2,924 linear feet of wetland and riparian zone drainages in Chokecherry and 15,497 linear feet in Sierra Madre. Of these initial impacts, impacts to wetland and riparian zone drainages associated with transmission lines would total 935 linear feet (258 linear feet in Chokecherry and 677 linear feet in Sierra Madre).

Impacts resulting from the decommissioning of the project (temporary disturbance) have the potential to occur and would be similar to impact levels resulting from the initial project construction. Decommissioning impacts would include direct impacts resulting from staging area use and indirect impacts associated with increased dust levels due to increased traffic levels.

According to the environmental constraints table (**Appendix C**, **Table C-1**), no disturbance would occur to wetlands and riparian zones mapped on BLM land, and surface disturbing activities within 500 feet of wetlands on BLM land will be avoided, or if the activity cannot be avoided, protection of wetlands would be provided. Of the 18,421 linear feet of drainage impacted, 1,077 linear feet would be on BLM land, including 444 linear feet in Chokecherry and 633 linear feet in Sierra Madre. Wetland and riparian zones would need to be delineated and mapped in more detail during the site-specific design process to ensure consistency and compliance with the Rawlins RMP ROD (2008), pg 2-99; Wyoming BLM Mitigation Guidelines; EOs 11990 and 11988.

Of the remaining impacts on private and state land, the applicant has committed to the following BMPs and conservation measures related to wetlands:

- Surface disturbing activities would be avoided to the maximum extent practicable. Where these features cannot be completely avoided, impacts would be minimized through design modifications, as necessary. Facilities (e.g., turbines, substations, staging areas) would be sited to avoid and/or minimize impacts; however, where impacts are anticipated (e.g., use of project

roads), minimization measures would be employed to minimize impacts (e.g., use of culverts to maintain downstream flow/drainage).

- All impacts would be the minimum necessary to accomplish the project, would be mitigated, and the appropriate Section 404 permit would be obtained from the USACE Wyoming Regulatory Office prior to the start of construction. To complete the Section 404 permit, a delineation of all waters of the U.S., including wetlands, would be performed by qualified wetland scientists to obtain current site-specific data regarding the location and extent of aquatic features within the alternative area. Current resource mapping (e.g., USGS topographic maps, USFWS NWI maps, FEMA floodplain maps, AECOM wetland and riparian data, NRCS soils data, etc.) would be used to guide this future delineation effort. All aquatic features delineated in the field would be recorded using GPS with sub-meter accuracy.
- Any construction that occurs in or adjacent to wetlands and streams would use BMPs to protect surface water quality and to minimize impacts to those resources. PCW would adopt the BMPs developed for the Programmatic EIS on Wind Energy Development (BLM 2005) during construction, operation, and decommissioning of this project.

Because of these ACMs, wetlands impacts on private and state land would be avoided, minimized, or mitigated. This would be ensured through the Section 404 permit process.

4.11.9 Alternative 2, Checkerboard Only

4.11.9.1 Impacts to Vegetation

Alternative 2 would result in total initial direct impacts to 8,795 acres of vegetation within the CCSM areas. Once reclaimed, Alternative 2 would result in 1,842 acres of long-term impacts within the CCSM areas. A summary of the impacts by vegetation type is provided in **Table 4.11-3**. The dominant vegetation types impacted initially include mountain big sagebrush and Wyoming big sagebrush with 4,006 acres and 2,267 acres, respectively. Saltbush is the next most common vegetation type impacted with 1,203 acres of total disturbance. Direct impacts associated with Alternative 2 are shown on **Figure 4.11.4** and in **Table 4.11-3**. Other indirect effects include impacts from construction dust, similar in nature to Alternative 1R. Final decommissioning impacts would be similar to the initial disturbance and followed by complete restoration to pre-project conditions.

4.11.9.2 Impacts from Noxious Weeds and Invasive Species

Under Alternative 2, a total of 8,795 acres of soil would be disturbed. Impacts associated with noxious weeds and invasive species would be similar to Alternative 1R; however, total disturbance would be 1,574 acres greater. Long-term disturbance associated with Alternative 2 would be 1,842 acres and include 477 miles of newly constructed roads. Direct impacts associated with the introduction and spread of noxious weeds and invasive species would be mitigated through the implementation of the BLM-approved Reclamation Plan. **Figure 4.11-5** illustrates the noxious weeds and invasive species in the vicinity of Alternative 2. Decommissioning of the project would be similar to the initial impacts, providing invasive and noxious weeds an opportunity to establish a foothold and spread.

4.11.9.3 Impacts to Wetlands and Associated Riparian Zones

Under Alternative 2, wind development would only be authorized above Township Line 18 to keep development primarily within the checkerboard landownership pattern.

Impacts to wetlands and riparian zone drainages would be similar to those described for Alternative 1R, except the amount of potential wetland and riparian zone disturbance would be greater. **Figure 4.11-6** shows wetland and riparian zone drainages within Alternative 2. Under Alternative 2, initial impacts would consist of 19,295 linear feet of drainage of which 5,802 linear feet are in Chokecherry and 13,493 linear feet are in Sierra Madre. Similar to Alternative 1R, initial wetland and riparian zone drainage impacts would consist of 957 linear feet associated with the transmission line, with 461 linear feet in Chokecherry and 496 linear feet in Sierra Madre.

Table 4.11-3 Direct Vegetation Impacts Associated with Alternative 2

Vegetation Community	Chokecherry		Sierra Madre		Total	
	Initial Disturbance (acres)	Long-term Disturbance (acres)	Initial Disturbance (acres)	Long-term Disturbance (acres)	Initial Disturbance (acres)	Long-term Disturbance (acres)
Mountain Big Sagebrush						
Grassland/Mountain Big Sagebrush	258	50	-	-	258	50
Mixed Shrub/Mountain Big Sagebrush	-	-	15	3	15	3
Mountain Big Sagebrush	2,310	459	1,215	231	3,526	690
Mountain Big Sagebrush/Bird's Foot Sagebrush	-	-	21	4	21	4
Mountain Big Sagebrush/Black Sagebrush	-	-	147	29	147	29
Steep/Rocky/Mountain Big Sagebrush	1	0	39	7	40	8
Mountain Big Sagebrush Subtotal	**2,569**	**509**	**1,437**	**275**	**4,006**	**784**
Saltbush						
Grassland/Saltbush	56	54	-	-	56	54
Saltbush	309	48	496	97	805	146
Saltbush/Bird's Foot Sagebrush	79	29	58	11	137	40
Saltbush/Goldenweed	-	-	39	8	39	8
Saltbush/Mountain Big Sagebrush	6	1	24	5	31	6
Saltbush/Mountain Big Sagebrush/Spiny Horsebrush	-	-	1	0	1	0
Saltbush/Spiny Horsebrush	-	-	14	3	14	3
Saltbush/Wyoming Big Sagebrush	101	20	18	4	119	24
Saltbush Subtotal	**552**	**152**	**651**	**129**	**1,203**	**280**
Wyoming Big Sagebrush						
Grassland/Wyoming Big Sagebrush	612	115	-	-	612	115
Wyoming Big Sagebrush	975	174	680	131	1,655	305
Wyoming Big Sagebrush/Rabbitbrush	-	-	1	0	1	0
Wyoming Big Sagebrush Subtotal	**1,587**	**290**	**680**	**131**	**2,267**	**420**

Table 4.11-3 Direct Vegetation Impacts Associated with Alternative 2

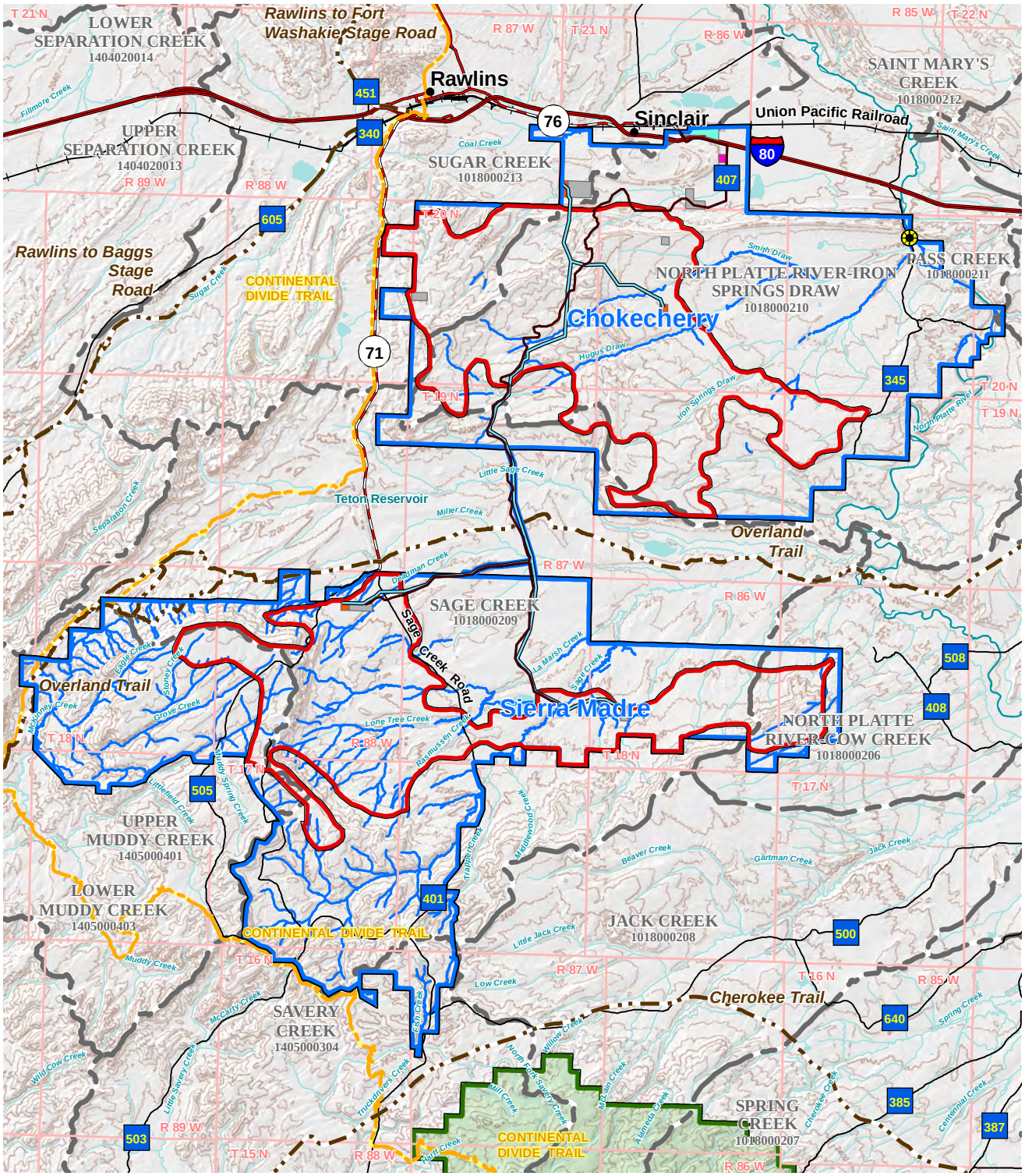
Vegetation Community	Chokecherry		Sierra Madre		Total	
	Initial Disturbance (acres)	Long-term Disturbance (acres)	Initial Disturbance (acres)	Long-term Disturbance (acres)	Initial Disturbance (acres)	Long-term Disturbance (acres)
Other						
Aspen	-	-	9	2	9	2
Basin Big Sagebrush	0	0	-	-	0	0
Black Sagebrush	7	1	-	-	7	1
Developed	24	6	-	-	24	6
Grassland	5	1	15	3	21	4
Grassland/ Bird's Foot Sagebrush	84	16	-	-	84	16
Greasewood	63	12	20	4	83	16
Greasewood/Mountain Big Sagebrush	173	168	-	-	173	168
Greasewood/Saltbush	213	49	-	-	213	49
Greasewood/Wyoming Big Sagebrush	110	15	1	0	110	15
Mixed Shrub	64	9	6	1	70	10
Rabbitbrush	1	0	-	-	1	0
Riparian	6	2	27	4	33	6
Riparian/Greasewood	10	2	14	2	25	4
Steep/Rocky	61	14	-	-	61	14
Utah Juniper	8	1	-	-	8	1

Table 4.11-3 Direct Vegetation Impacts Associated with Alternative 2

Vegetation Community	Chokecherry		Sierra Madre		Total	
	Initial Disturbance (acres)	Long-term Disturbance (acres)	Initial Disturbance (acres)	Long-term Disturbance (acres)	Initial Disturbance (acres)	Long-term Disturbance (acres)
Wet Meadow	-	-	23	4	23	4
Wild Rye	1	0	-	-	1	0
Other Subtotal	**829**	**297**	**116**	**21**	**945**	**317**

Note: GIS estimates use assumed component locations to generate disturbance associated with vegetation type. While these estimates may vary somewhat from disturbance estimates that were generated by assuming an average amount of disturbance associated with each project component proposed by alternative (as presented in Chapter 2.0), the difference is estimated to be less than 5 percent.

Source: AECOM 2009; PCW 2008b.



Legend

- Haul Road
- Transmission Line
- Alternate O&M Facility
- Intermodal Rail Facility
- Staging Area (Construction Only)
- Substation
- Water Extraction Site
- Project Area
- Likely Area of Turbine Construction
- Potential Wetlands and Riparian Zones
- National Forest
- Interstate Highway
- U.S. Highway
- State Highway
- Continental Divide Trail
- Historic Trail
- River or Creek
- Lake or Reservoir

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.11-3

Wetland and Riparian Zones Impacts within Alternative 1R

0 1 2 4 Miles
0 1 2 4 Kilometers
1:300,000
N

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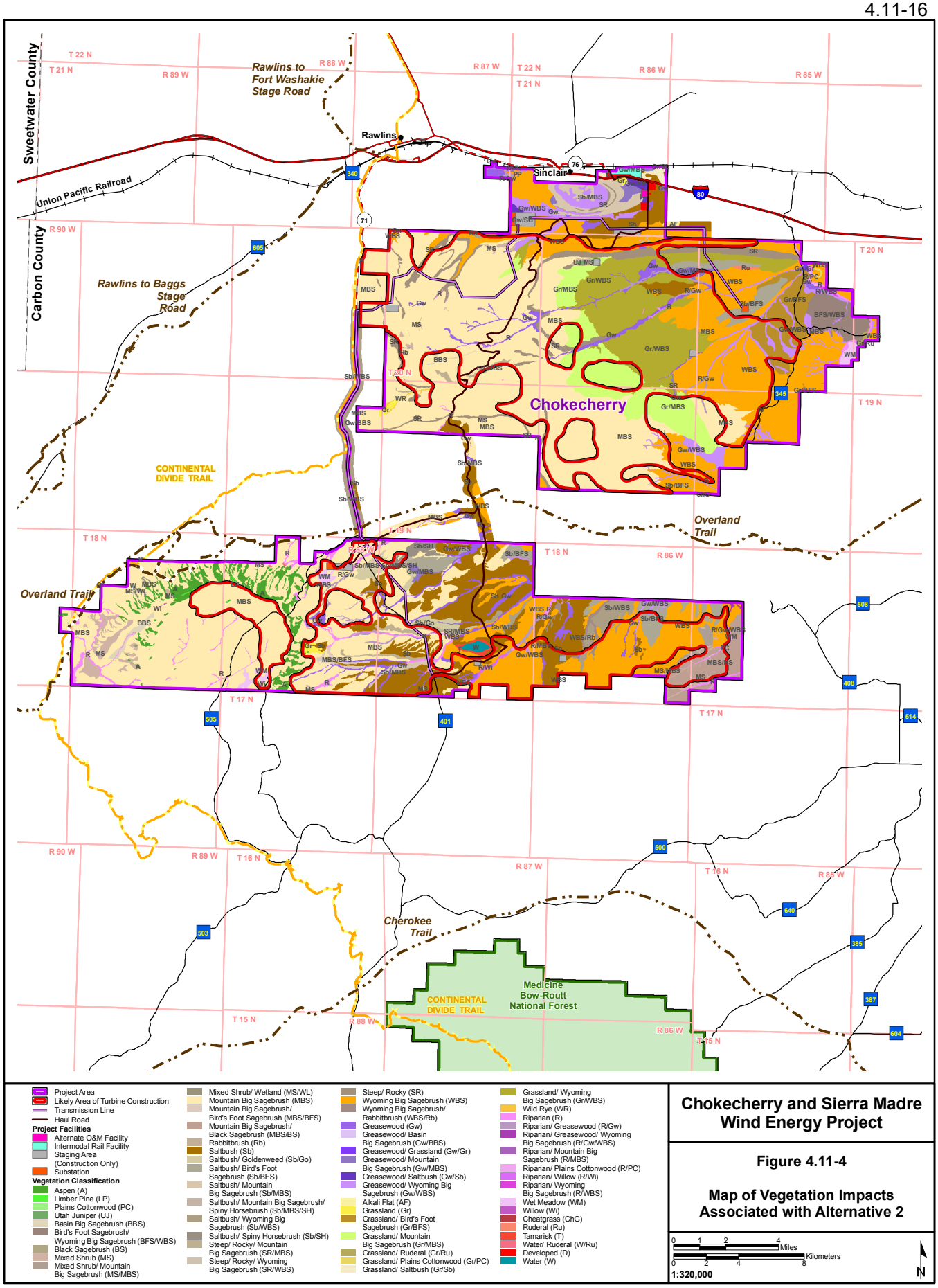

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.11-4

Map of Vegetation Impacts Associated with Alternative 2

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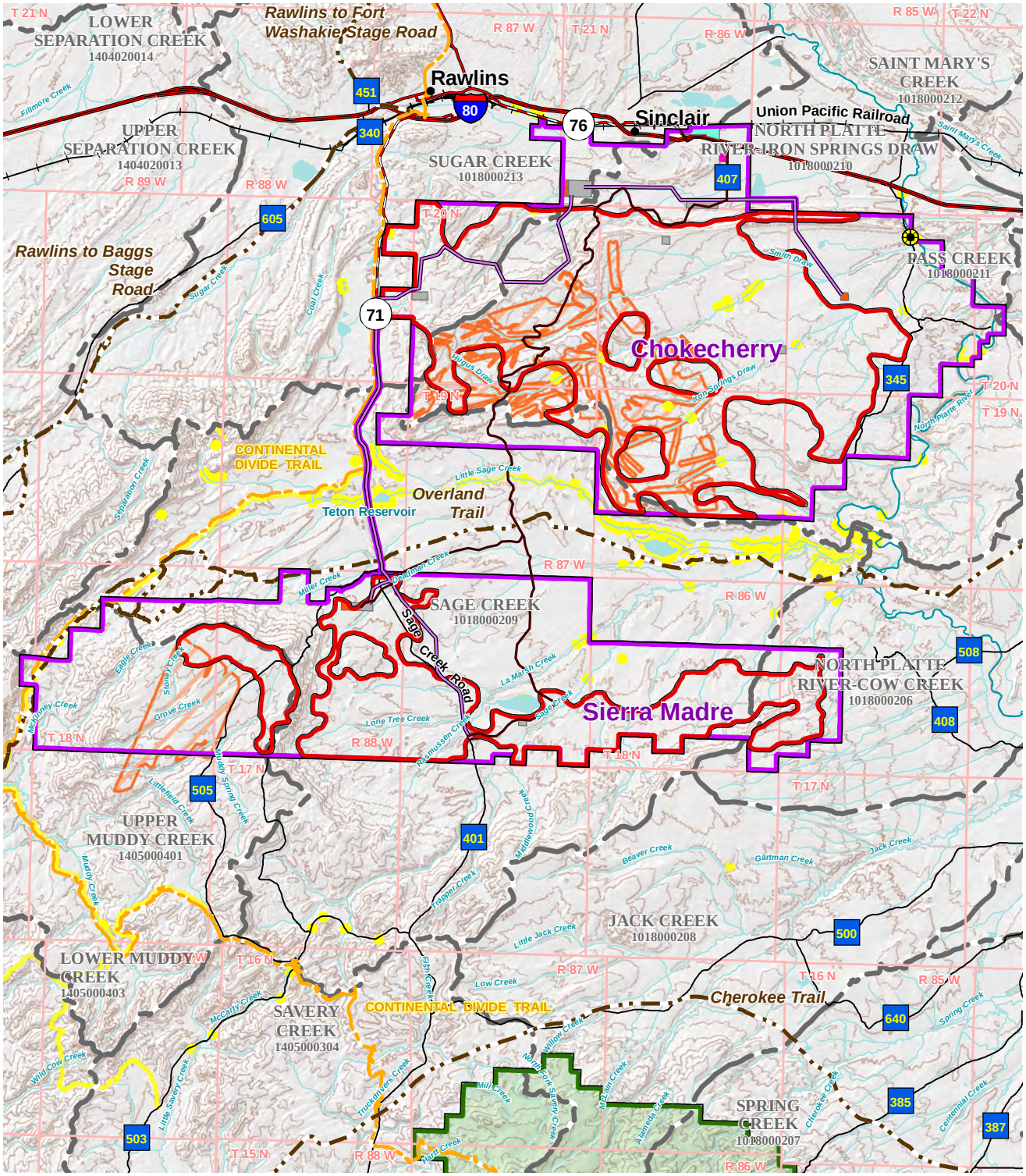

Legend

- Water Extraction Site
- Haul Road
- Transmission Line
- Alternate O&M Facility
- Intermodal Rail Facility
- Staging Area (Construction Only)
- Substation
- Project Area
- Likely Area of Turbine Construction
- Spike Treatment for Sagebrush Enhancement
- Noxious Weed Location (Not to Scale)
- National Forest
- Interstate Highway
- U.S. Highway
- State Highway
- Continental Divide Trail
- Historic Trail
- River or Creek
- Lake or Reservoir
- Watershed Boundary

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.11-5

Map of Known Noxious and Invasive Weeds in Vicinity of Alternative 2

0 1 2 4 Miles
0 1 2 4 Kilometers
1:300,000
N

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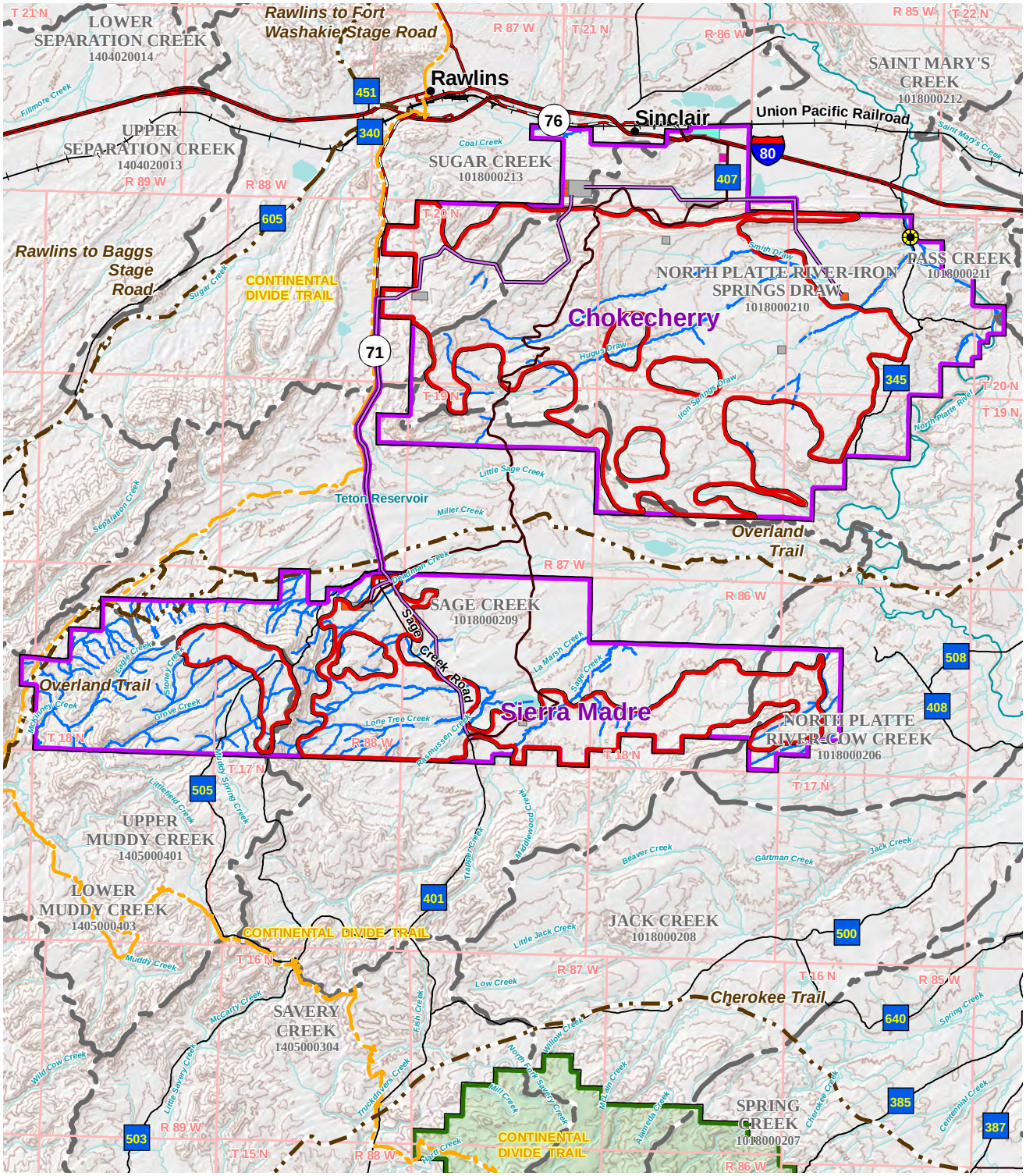

Legend

- Haul Road
- Transmission Line
- Alternate O&M Facility
- Intermodal Rail Facility
- Staging Area (Construction Only)
- Substation
- Water Extraction Site
- Project Area
- Likely Area of Turbine Construction
- Potential Wetlands and Riparian Zones
- National Forest
- Interstate Highway
- U.S. Highway
- State Highway
- Continental Divide Trail
- Historic Trail
- River or Creek
- Lake or Reservoir

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.11-6

Wetland and Riparian Zones Impacts within Alternative 2

0 1 2 4 Miles
0 1 2 4 Kilometers
1:300,000
N

Impacts resulting from the decommissioning of the project (temporary disturbance) have the potential to occur and would be similar to impact levels resulting from project operations. Decommissioning impacts would include direct impacts resulting from staging area use and indirect effects associated with increased dust levels due to increased traffic levels.

As with Alternative 1R, the environmental constraints table (see **Appendix C**, **Table C-1**) states that: 1) no disturbance will occur to wetlands and riparian zone drainages on BLM land; and 2) surface disturbing activities within 500 feet of wetlands on BLM land will be avoided, or if the activity cannot be avoided, protection of wetlands will be provided. Of the 19,295 linear feet of wetland and riparian zone drainage, 907 linear feet would occur on BLM land (410 linear feet in Chokecherry and 497 linear feet in Sierra Madre) and would need to be evaluated further during the site-specific design process to ensure consistency with Rawlins RMP ROD (2008; pg 2-99; Wyoming BLM Mitigation Guidelines; EOs 11990 and 11988). Impacts to wetlands and riparian zones on BLM land associated with Alternative 2 are less than Alternative 1R.

Of the remaining impacts on private and state land, the applicant has committed to BMPs and conservation measures (Section 4.11.8.3) that would avoid, minimize, or mitigate wetland impacts. This would be ensured through the Section 404 permit process.

4.11.10 Alternative 3, No Miller Hill or Sierra Madre

4.11.10.1 Impacts to Vegetation

Alternative 3 would result in initial direct impacts to 8,504 acres of vegetation within the CCSM areas. Once reclaimed, Alternative 3 would result in 1,780 acres of long-term impacts within the CCSM areas. A summary of initial and long-term impacts by vegetation type are provided in **Table 4.11-4**. The dominant vegetation types impacted include mountain big sagebrush and Wyoming big sagebrush with 3,777 acres and 2,289 acres, respectively. Saltbush is the next most common vegetation type with 1,293 acres of total disturbance. Direct impacts associated with Alternative 3 are shown on **Figure 4-11.7** and in **Table 4.11-4**. Decommissioning impacts would be similar to initial impacts; however, impacts would be restored to pre-project conditions.

4.11.10.2 Impacts from Noxious Weeds and Invasive Species

Under Alternative 3, a total of 8,504 acres of soil would be disturbed. Impacts associated with noxious weeds and invasive species would be similar to Alternative 1R; however, disturbance would be 988 acres greater. Long-term disturbance associated with Alternative 2 would be 1,283 acres and include 459 miles of newly constructed roads. Alternative 3 would avoid additional disturbance to the more weed-free areas of Miller Hill and Sierra Madre. Direct impacts associated with the introduction and spread of noxious weeds and invasive species would be mitigated through the implementation of the BLM-approved Reclamation Plan. **Figure 4.11-8** illustrates the noxious weeds and invasive species in the vicinity of Alternative 3. Impacts associated with decommissioning of the project would result in impacts similar to the initial disturbance, exposing soil and providing opportunities for invasive and noxious weeds to gain a foothold and spread.

4.11.10.3 Impacts to Wetlands and Associated Riparian Zones

Under Alternative 3, wind development would be authorized in the Chokecherry portion of the alternative area and the area from the eastern half of T18, R88 to the east of the Sierra Madre portion of the alternative area to accommodate displaced turbines to achieve 1,000 turbines. All lands would be excluded below Township line 18, T18, R89, and the western half of T18, R89. **Figure 4.11-9** shows impacts to wetlands and riparian zone drainages within Alternative 3.

Table 4.11-4 Direct Vegetation Impacts Associated with Alternative 3, No Miller Hill, or Sierra Madre

Vegetation Community	Chokecherry		Sierra Madre		Total	
	Initial Disturbance (acres)	Long-term Disturbance (acres)	Initial Disturbance (acres)	Long-term Disturbance (acres)	Initial Disturbance (acres)	Long-term Disturbance (acres)
Mountain Big Sagebrush						
Grassland/Mountain Big Sagebrush	337	66	-	-	337	66
Mixed Shrub/Mountain Big Sagebrush	-	-	15	3	15	3
Mountain Big Sagebrush	2,484	494	740	119	3,224	612
Mountain Big Sagebrush/Bird's Foot Sagebrush	-	-	24	5	24	5
Mountain Big Sagebrush/Black Sagebrush	-	-	135	27	135	27
Steep/ Rocky/Mountain Big Sagebrush	1	0	41	8	42	8
Mountain Big Sagebrush Subtotal	**2,822**	**560**	**955**	**161**	**3,777**	**721**
Saltbush						
Grassland/Saltbush	56	54	-	-	56	54
Saltbush	309	48	513	107	822	156
Saltbush/Bird's Foot Sagebrush	79	29	89	18	167	47
Saltbush/Goldenweed	-	-	42	9	42	9
Saltbush/Mountain Big Sagebrush	6	1	25	5	31	6
Saltbush/Mountain Big Sagebrush/Spiny Horsebrush	-	-	1	0	1	0
Saltbush/Spiny Horsebrush	-	-	22	4	22	4
Saltbush/Wyoming Big Sagebrush	101	20	51	10	152	30
Saltbush Subtotal	**551**	**152**	**742**	**153**	**1,293**	**305**
Wyoming Big Sagebrush						
Grassland/Wyoming Big Sagebrush	627	118	-	-	627	118
Wyoming Big Sagebrush	992	177	669	129	1,660	306
Wyoming Big Sagebrush/Rabbitbrush	-	-	2	0	2	0
Wyoming Big Sagebrush Subtotal	**1,619**	**295**	**670**	**129**	**2,289**	**424**

Table 4.11-4 Direct Vegetation Impacts Associated with Alternative 3, No Miller Hill, or Sierra Madre

Vegetation Community	Chokecherry		Sierra Madre		Total	
	Initial Disturbance (acres)	Long-term Disturbance (acres)	Initial Disturbance (acres)	Long-term Disturbance (acres)	Initial Disturbance (acres)	Long-term Disturbance (acres)
Other						
Aspen	-	-	1	0	1	0
Basin Big Sagebrush	1	0	-	-	1	0
Black Sagebrush	7	1	-	-	7	1
Developed	24	6	-	-	24	6
Grassland	5	1	11	2	17	3
Grassland/ Bird's Foot Sagebrush	84	16	-	-	84	16
Greasewood	61	11	26	5	87	16
Greasewood/Mountain Big Sagebrush	173	168	-	-	173	168
Greasewood/Saltbush	213	49	-	-	213	49
Greasewood/Wyoming Big Sagebrush	114	16	2	0	116	16
Mixed Shrub	64	9	4	1	68	10
Rabbitbrush	1	0	-	-	1	0
Riparian	6	2	25	3	31	5
Riparian/Greasewood	10	2	18	3	28	5
Steep/Rocky	66	16	-	-	66	16
Utah Juniper	8	1	-	-	8	1
Wet Meadow	-	-	16	3	16	3
Wild Rye	1	0	-	-	1	0
Other Subtotal	**838**	**298**	**103**	**18**	**941**	**316**

Note: GIS estimates use assumed component locations to generate disturbance associated with vegetation type. While these estimates may vary somewhat from disturbance estimates that were generated by assuming an average amount of disturbance associated with each project component proposed by alternative (as presented in Chapter 2.0), the difference is estimated to be less than 5 percent.

Sources: AECOM 2009; PCW 2008b.

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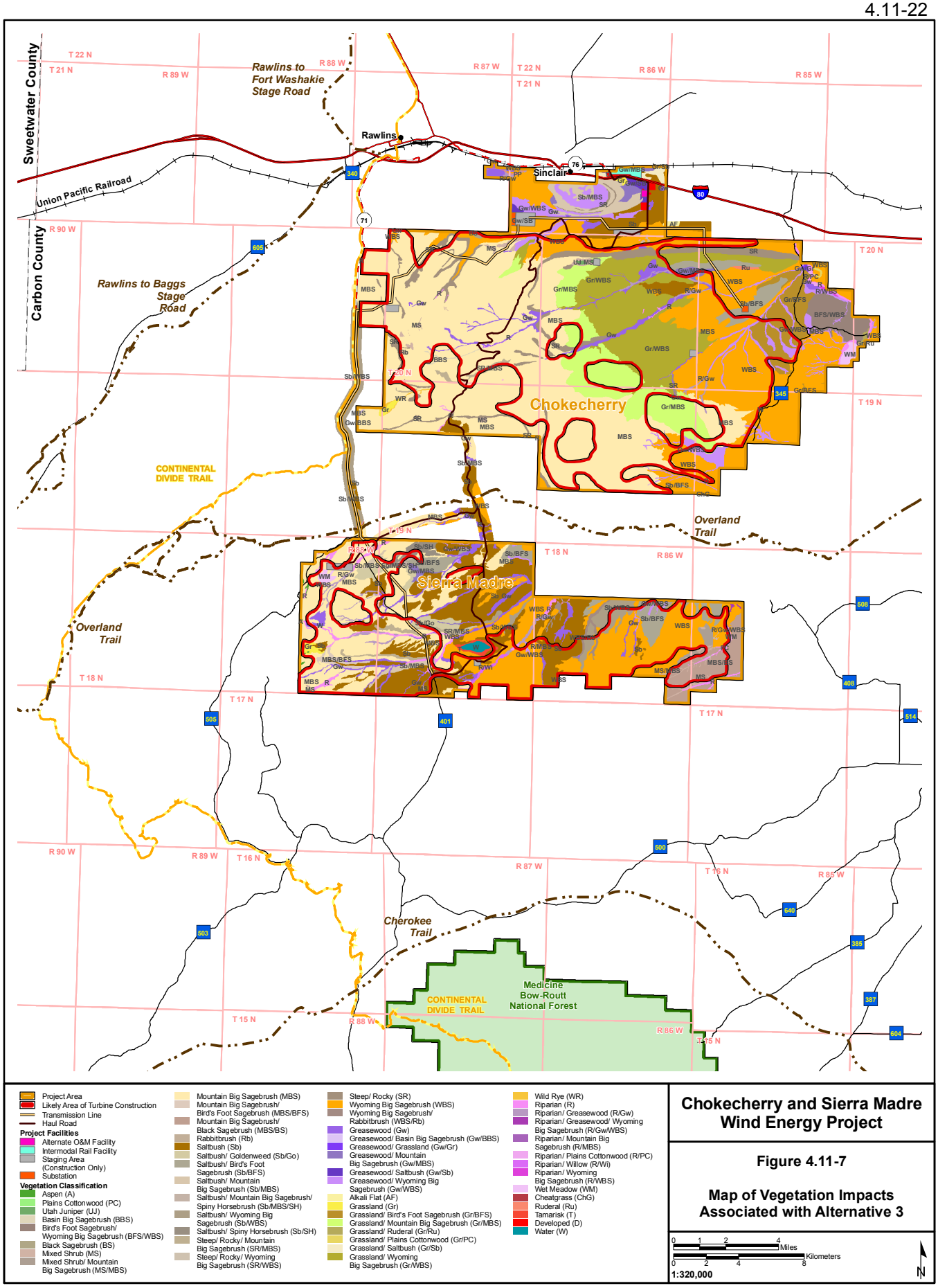

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.11-7

Map of Vegetation Impacts Associated with Alternative 3

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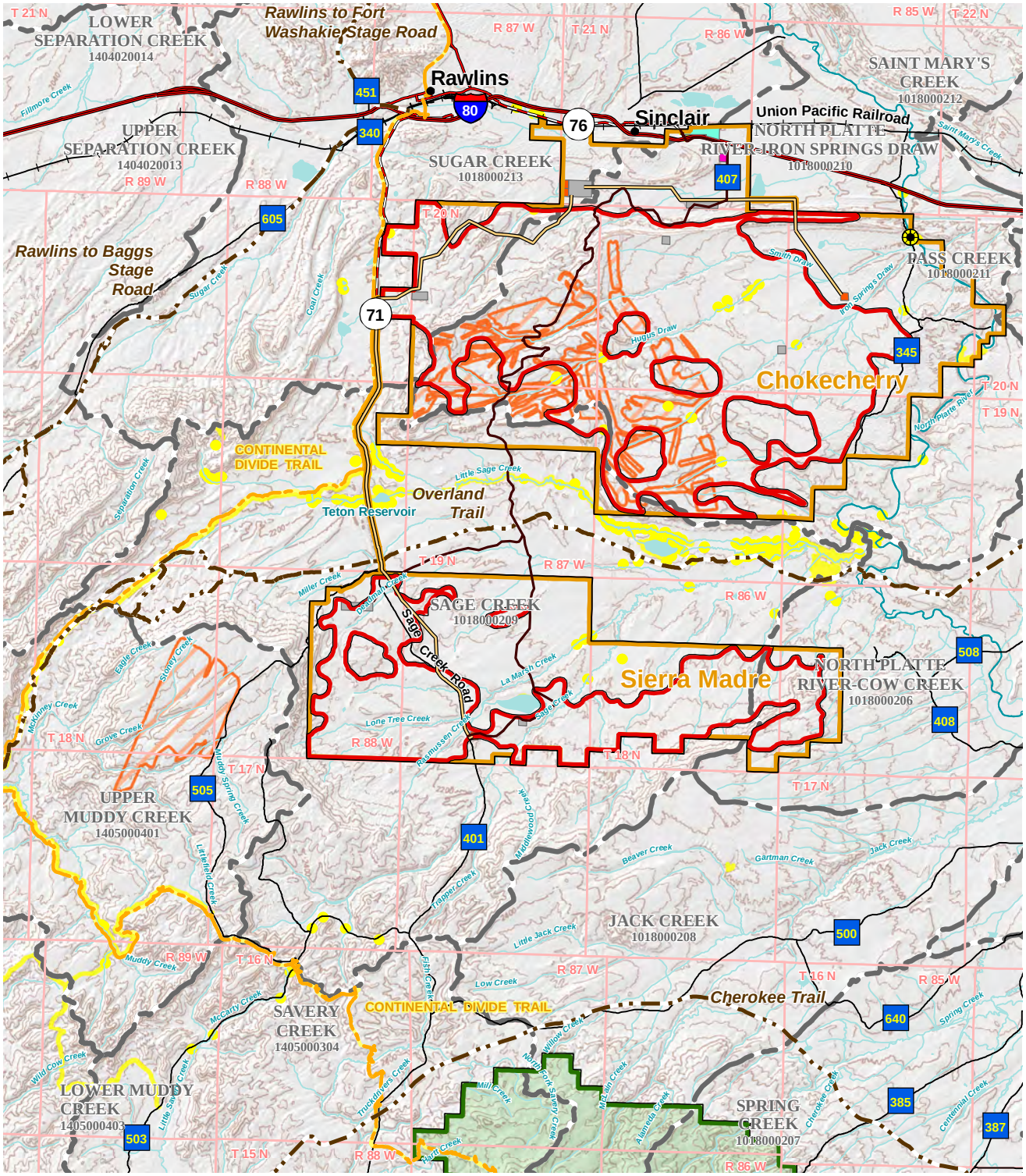

Legend

- Water Extraction Site
- Haul Road
- Transmission Line
- Alternate O&M Facility
- Intermodal Rail Facility
- Staging Area (Construction Only)
- Substation
- Project Area
- Likely Area of Turbine Construction
- Spike Treatment for Sagebrush Enhancement
- Noxious Weed Location (Not to Scale)
- National Forest
- Interstate Highway
- U.S. Highway
- State Highway
- Continental Divide Trail
- Historic Trail
- River or Creek
- Lake or Reservoir
- Watershed Boundary

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.11-8

Map of Known Noxious and Invasive Weeds in Vicinity of Alternative 3

0 1 2 4 Miles
0 1 2 4 Kilometers
1:300,000
N

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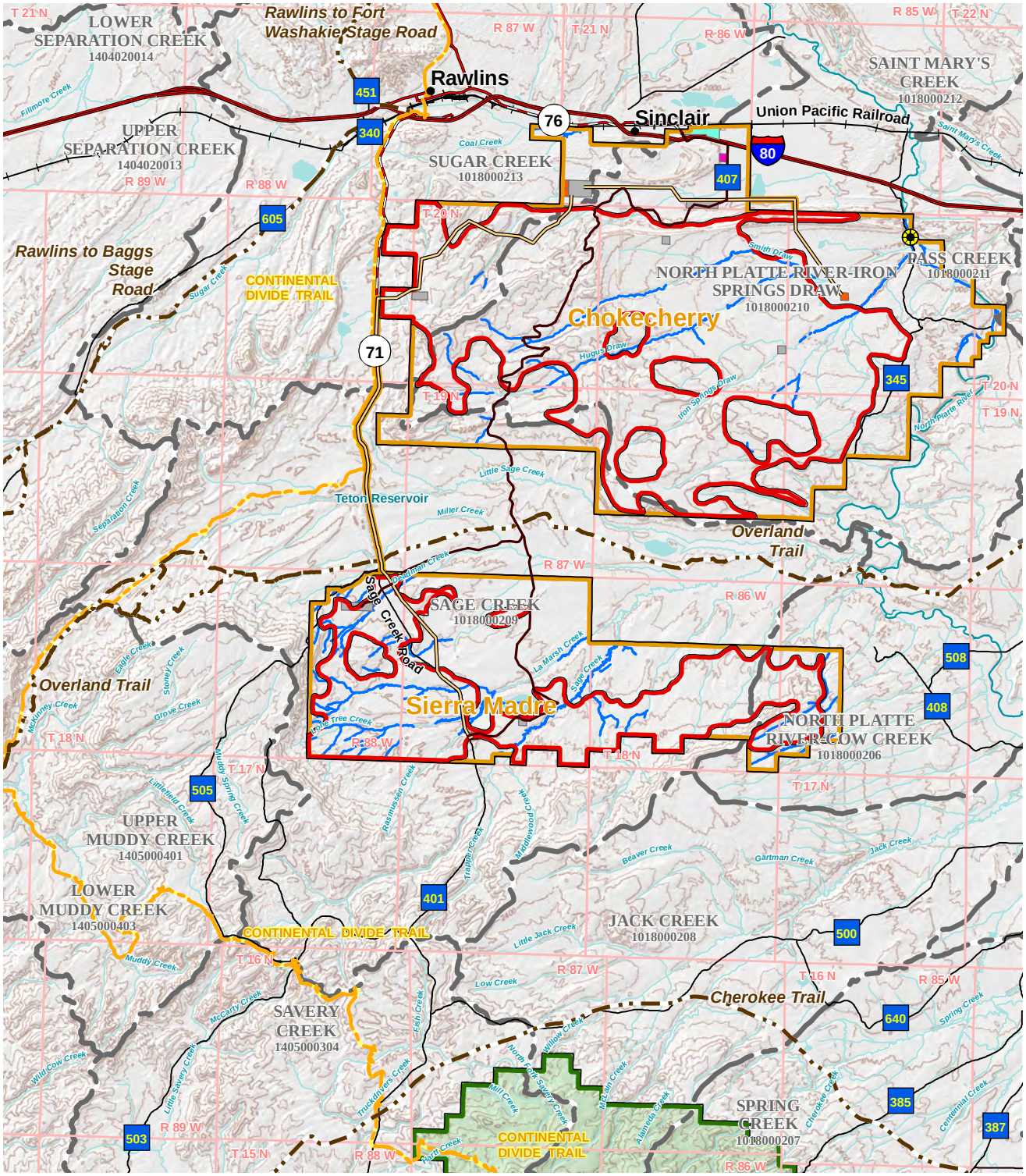

Legend

- Haul Road
- Transmission Line
- Alternate O&M Facility
- Intermodal Rail Facility
- Staging Area (Construction Only)
- Substation
- Water Extraction Site
- Project Area
- Likely Area of Turbine Construction
- Potential Wetlands and Riparian Zones
- National Forest
- Interstate Highway
- U.S. Highway
- State Highway
- Continental Divide Trail
- Historic Trail
- River or Creek
- Lake or Reservoir

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.11-9

Wetland and Riparian Zones Impacts within Alternative 3

0 1 2 4 Miles
0 1 2 4 Kilometers
1:300,000
N

Impacts to wetlands would be as described for Alternative 1R, except the amount of potential wetland disturbance would differ. The amount of linear wetland and riparian zone disturbance would be less than both Alternative 1R and Alternative 2. Under Alternative 3, initial impacts to linear wetlands and riparian zones would be 16,174 linear feet of which 5,467 linear feet would be on Chokecherry and 10,707 linear feet would be on Sierra Madre. Similar to Alternative 2, only 957 linear feet of these impacts would be associated with the transmission line, of which 461 linear feet would be in Chokecherry and 496 linear feet would be in Sierra Madre.

Impacts resulting from the decommissioning of the project (temporary disturbance) have the potential to occur and would be similar to impact levels resulting from project construction. Decommissioning impacts would include direct impacts resulting from staging area use and increased dust levels due to increased traffic levels.

As with the other alternatives, the environmental constraints table (**Appendix C**, **Table C-1**) states that: 1) no disturbance will occur to wetlands identified on NWI maps on BLM land; and 2) surface disturbing activities within 500 feet of wetlands on BLM land will be avoided, or if the activity cannot be avoided, protection of wetlands will be provided. Of the 16,174 linear feet of long-term disturbance, 702 linear feet occurs on BLM land (410 linear feet in Chokecherry and 292 linear feet in Sierra Madre) would need to be evaluated further during the site-specific design process to ensure consistency with Rawlins RMP ROD (2008, pg 2-99; Wyoming BLM Mitigation Guidelines; EOs 11990 and 11988). Alternative 3 would result in fewer impacts to wetlands and riparian zones on BLM land than Alternatives 1R and 2.

Of the remaining wetland and riparian zone drainage disturbance on private and state lands, the applicant has committed to BMPs and conservation measures (Section 4.11.8.3) that would avoid, minimize, or mitigate wetland impacts. This would be ensured through the Section 404 permit process.

4.11.10.4 Alternative 4, Private Lands Only

4.11.10.5 Impacts to Vegetation

Alternative 4 would result in direct impacts to 8,918 acres of vegetation with the CCSM areas. Once reclaimed, Alternative 4 would result in 1,871 acres of long-term impacts within the CCSM areas. A summary of initial and long-term impacts by vegetation type are provided in **Table 4.11-5**. The dominant vegetation types impacted initially include mountain big sagebrush and Wyoming big sagebrush with 3,646 acres and 2,165 acres, respectively. Saltbush is the next most common vegetation type with 1,551 acres of total disturbance. Direct impacts associated with Alternative 4 are shown on **Figure 4-11.10** and in **Table 4.11-5**. Decommissioning of the project would result in impacts to vegetation that are similar in size and nature to the initial impacts. However, all impacts would be restored back to pre-project conditions.

4.11.10.6 Impacts from Noxious Weeds and Invasive Species

Under Alternative 4, a total of 8,918 acres of soil would be disturbed. Impacts associated with noxious weeds and invasive species would be similar to Alternative 1R; however, disturbance would be 1,697 acres greater. Long-term disturbance associated with Alternative 2 would be 1,871 acres and include 513 miles of newly constructed roads. Direct impacts associated with the introduction and spread of noxious weeds and invasive species would be mitigated through the implementation of the BLM-approved Reclamation Plan. **Figure 4.11-11** illustrates noxious weeds and invasive species in the vicinity of Alternative 4. The decommissioning of the project would expose soil to potential invasive and noxious weed infestations that are similar to the initial project disturbance.

Table 4.11-5 Direct Vegetation Impacts Associated with Alternative 4

Vegetation Community	Chokecherry		Sierra Madre		Total	
	Initial Disturbance (acres)	Long-term Disturbance (acres)	Initial Disturbance (acres)	Long-term Disturbance (acres)	Initial Disturbance (acres)	Long-term Disturbance (acres)
Mountain Big Sagebrush						
Grassland/Mountain Big Sagebrush	321	64	13	3	334	66
Mountain Big Sagebrush	1,969	392	1,194	221	3,163	613
Mountain Big Sagebrush/Bird's Foot Sagebrush	-	-	21	4	21	4
Mountain Big Sagebrush/Black Sagebrush	-	-	89	18	89	18
Steep/Rocky/Mountain Big Sagebrush	2	0	37	7	39	8
Mountain Big Sagebrush Subtotal	**2,293**	**456**	**1,353**	**253**	**3,646**	**709**
Saltbush						
Grassland/Saltbush	56	54	-	-	56	54
Saltbush	320	51	680	134	999	184
Saltbush/Bird's Foot Sagebrush	111	35	105	21	216	57
Saltbush/Goldenweed	-	-	28	5	28	5
Saltbush/Mountain Big Sagebrush	6	1	21	4	27	5
Saltbush/Mountain Big Sagebrush/Spiny Horsebrush	-	-	1	0	1	0
Saltbush/Spiny Horsebrush	-	-	38	7	38	7
Saltbush/Wyoming Big Sagebrush	101	20	85	17	186	37
Saltbush Subtotal	**595**	**161**	**956**	**189**	**1,551**	**350**
Wyoming Big Sagebrush						
Grassland/Wyoming Big Sagebrush	538	102	-	-	538	102
Wyoming Big Sagebrush	997	180	624	121	1,621	301
Wyoming Big Sagebrush/Rabbitbrush	-	-	6	1	6	1
Wyoming Big Sagebrush Subtotal	**1,535**	**282**	**630**	**122**	**2,165**	**404**

Table 4.11-5 Direct Vegetation Impacts Associated with Alternative 4

Vegetation Community	Chokecherry		Sierra Madre		Total	
	Initial Disturbance (acres)	Long-term Disturbance (acres)	Initial Disturbance (acres)	Long-term Disturbance (acres)	Initial Disturbance (acres)	Long-term Disturbance (acres)
Other						
Aspen	-	-	21	4	21	4
Basin Big Sagebrush	0	0	-	-	0	0
Black Sagebrush	7	1	-	-	7	1
Developed	24	6	-	-	24	6
Grassland	10	2	22	5	33	7
Grassland/Bird's Foot Sagebrush	115	23	-	-	115	23
Greasewood	62	12	43	9	105	20
Greasewood/Mountain Big Sagebrush	174	168	1	0	175	168
Greasewood/Saltbush	213	49	-	-	213	49
Greasewood/Wyoming Big Sagebrush	134	20	8	1	142	22
Mixed Shrub	58	7	4	1	62	8
Rabbitbrush	1	0	-	-	1	0
Riparian	6	2	31	5	36	6
Riparian/Greasewood	11	2	17	3	28	5
Steep/Rocky	62	15	-	-	62	15
Tamarisk	-	-	4	1	4	1
Utah Juniper	6	0	-	-	6	0
Wet Meadow	-	-	16	3	16	3
Wild Rye	4	1	-	-	4	1
Other Subtotal	**887**	**309**	**166**	**31**	**1,053**	**340**

Note: GIS estimates use assumed component locations to generate disturbance associated with vegetation type. While these estimates may vary somewhat from disturbance estimates that were generated by assuming an average amount of disturbance associated with each project component proposed by alternative (as presented in Chapter 2.0), the difference is estimated to be less than 5 percent.

Source: AECOM 2009; PCW 2008b.

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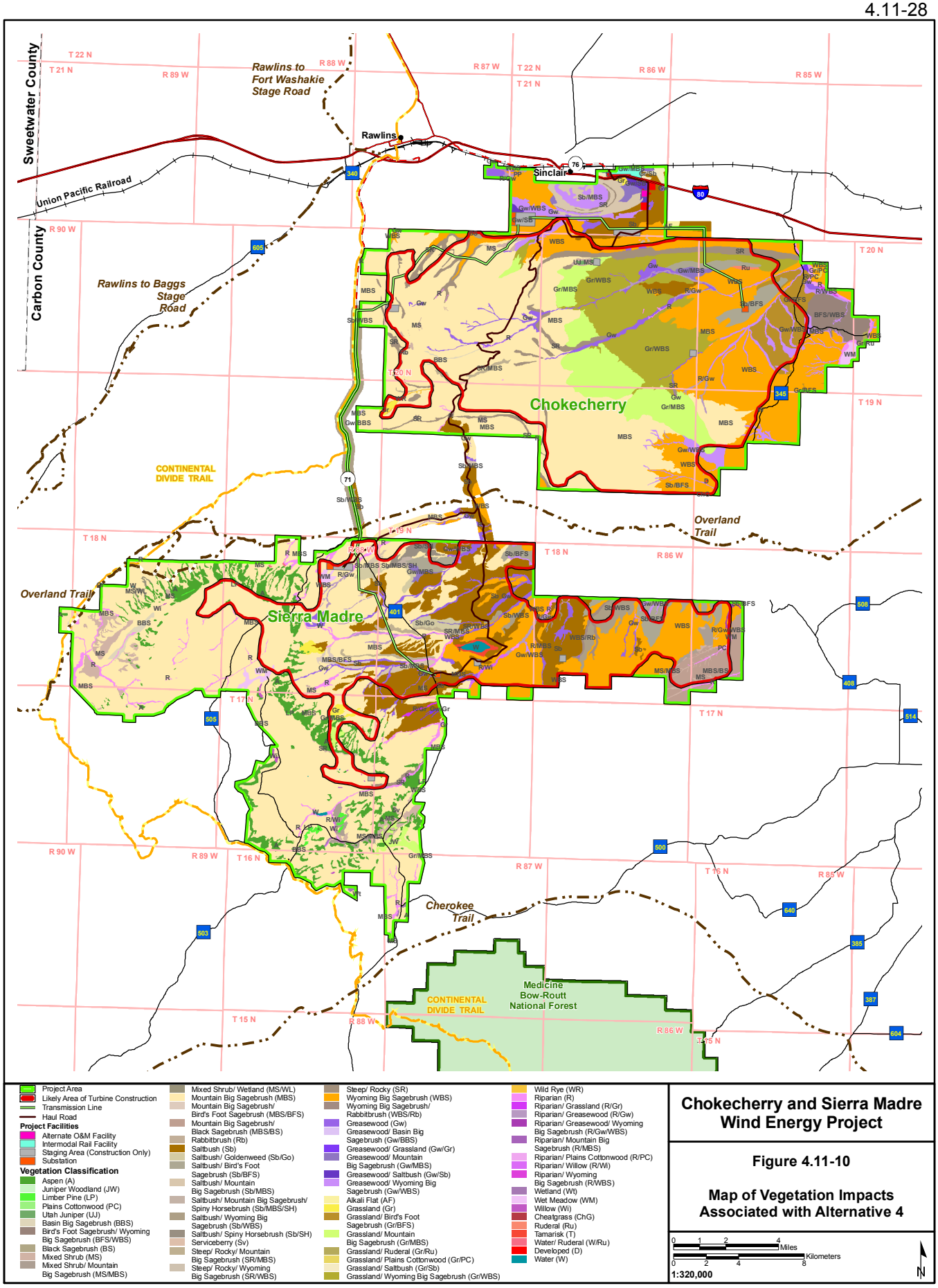

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.11-10

Map of Vegetation Impacts Associated with Alternative 4

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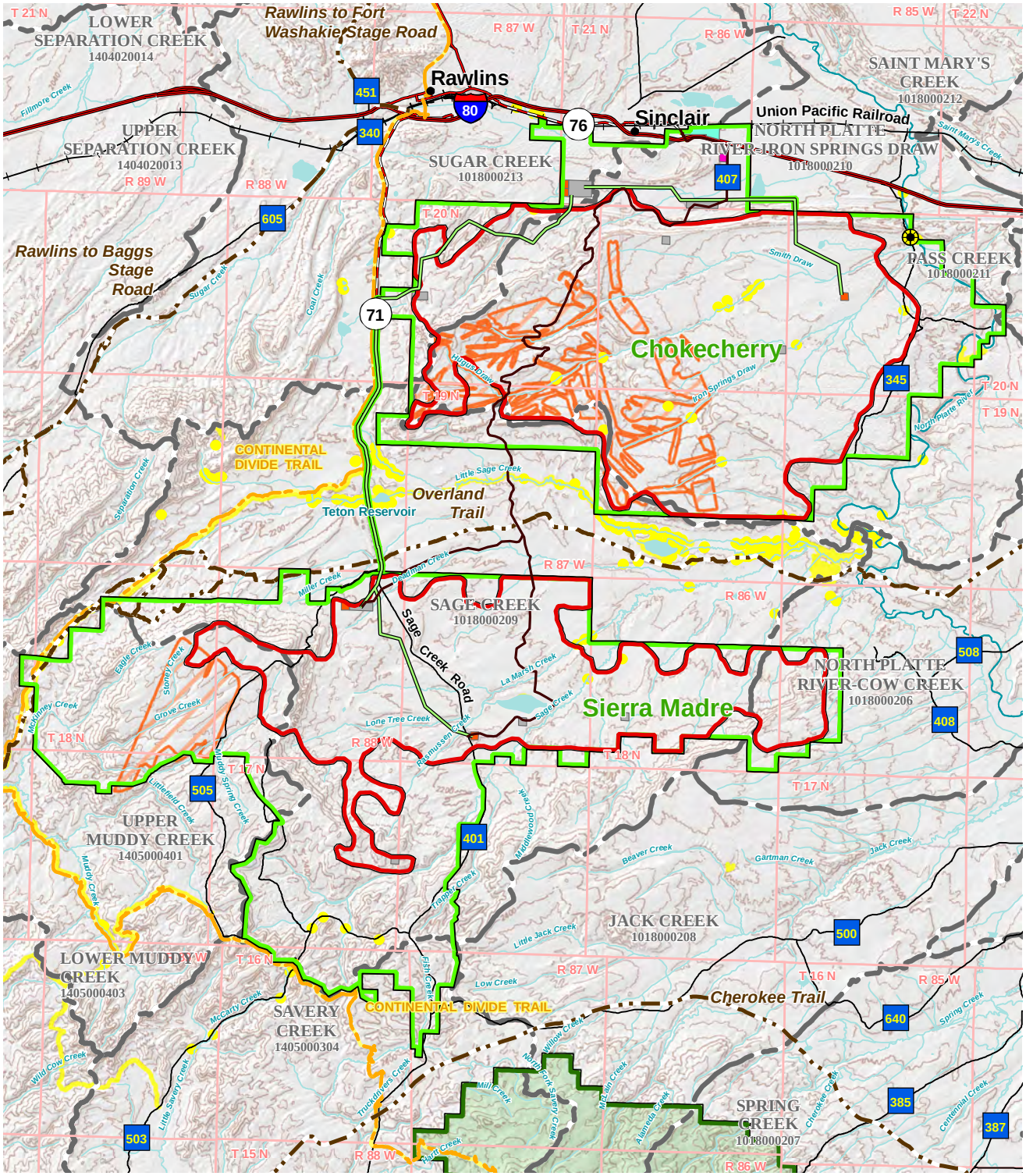

Legend

- Water Extraction Site
- Haul Road
- Transmission Line
- Alternate O&M Facility
- Intermodal Rail Facility
- Staging Area (Construction Only)
- Substation
- Project Area
- Likely Area of Turbine Construction
- Spike Treatment for Sagebrush Enhancement
- Noxious Weed Location (Not to Scale)
- National Forest
- Interstate Highway
- U.S. Highway
- State Highway
- Continental Divide Trail
- Historic Trail
- River or Creek
- Lake or Reservoir
- Watershed Boundary

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.11-11

Map of Known Noxious and Invasive Weeds in Vicinity of Alternative 4

0 1 2 4 Miles
0 1 2 4 Kilometers
1:300,000
N

4.11.10.7 Impacts to Wetlands and Associated Riparian Zones

Under Alternative 4, wind development would not be authorized on BLM lands. BLM would provide reasonable access to private lands to allow the applicant to relocate 1,000 turbines to private lands in the alternative area.

Impacts to wetlands would be as described for the other action alternatives, except the amount of potential wetland disturbance would be greatest under Alternative 4. **Figure 4.11-12** shows wetland and riparian zone drainages within Alternative 4. Under Alternative 4, a total of 23,125 linear feet of wetland and riparian zone drainage would be initially impacted for the long term. These wetlands and riparian zone drainages would consist of 6,422 linear feet at Chokecherry and 16,703 linear feet at Sierra Madre.

Construction-related impacts are greater than operational impacts because it is assumed that some of the disturbance would be temporary (e.g., due to the transmission line). Approximately 1,352 linear feet of wetland and riparian zone drainage would be associated with transmission line impacts and could be restored, of which 461 linear feet would be in Chokecherry and 891 linear feet would be in Sierra Madre.

Impacts resulting from the decommissioning of the project (temporary disturbance) have the potential to occur and would be similar to impact levels resulting from project construction. Decommissioning impacts would include direct impacts resulting from staging area use and increased dust levels due to increased traffic levels.

As with the other alternatives, the environmental constraints table (**Appendix C**, **Table C-1**) states that: 1) no disturbance will occur to wetlands and riparian zone drainages on BLM land; and 2) surface disturbing activities within 500 feet of wetlands on BLM land will be avoided, or if the activity cannot be avoided, protection of wetlands will be provided. Therefore, of the 23,125 linear feet of impacts, 435 linear feet of wetland and riparian zone drainage would occur on BLM land (314 linear feet in Chokecherry and 121 linear feet in Sierra Madre) would need to be evaluated further during the site-specific design process to ensure consistency with Rawlins RMP ROD (2008, pg 2-99; Wyoming BLM Mitigation Guidelines; EOs 11990 and 11988). Impacts to wetlands and riparian zones on BLM land associated with Alternative 4 are less than Alternatives 1 and 2, but greater than Alternative 3.

Of the remaining acreage on private and state land, the applicant has committed to BMPs and conservation measures (Section 4.11.8.3) that would avoid, minimize, or mitigate wetland impacts. This would be ensured through the Section 404 permit process.

4.11.11 Mitigation and Mitigation Effectiveness

Mitigation measures are meant to minimize adverse contrasts of project components with the existing landscape. The measures should be applied to all proposed components, even those that meet vegetation objectives. Mitigation would enable proposed project activities to harmonize with the surrounding landscape to the extent feasible. Mitigation measures do not include ACMs or BLM standard mitigation, which are incorporated into the proposed project. In general, resource protection measures are proposed for erosion control, road construction, rehabilitation and revegetation.

GEN-1: Phased Construction Sequence Mitigation (Chapter 2.0 and **Appendix A**, Section A.1.3.1) would change all action alternatives by issuing four ROW grants for the project, sequenced to limit surface disturbance to areas where WTGs would be constructed within 12 months with a goal to mitigate impacts from surface disturbance.

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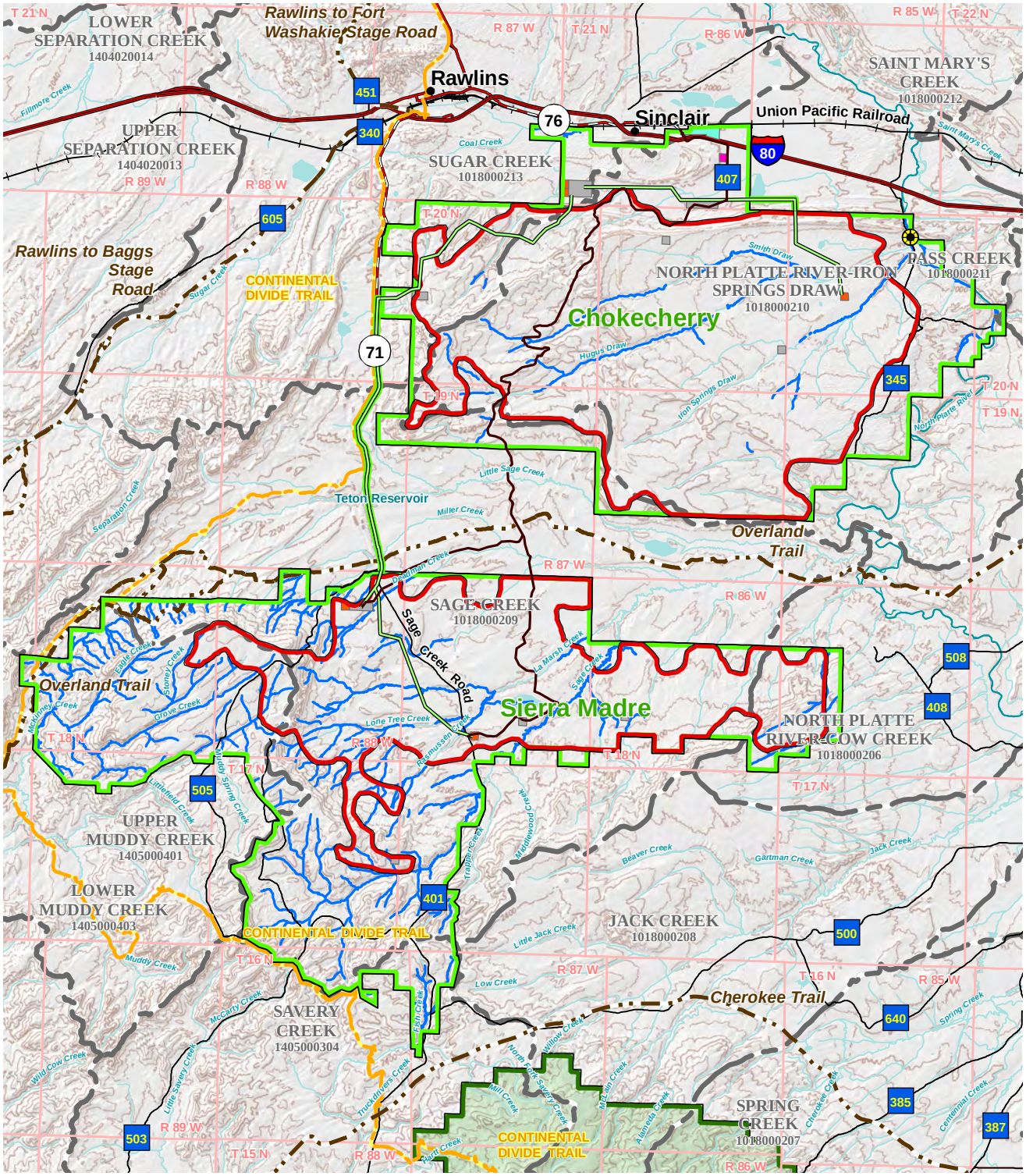

Legend

- Haul Road
- Transmission Line
- Alternate O&M Facility
- Intermodal Rail Facility
- Staging Area (Construction Only)
- Substation
- Water Extraction Site
- Project Area
- Likely Area of Turbine Construction
- Potential Wetlands and Riparian Zones
- National Forest
- Interstate Highway
- U.S. Highway
- State Highway
- Continental Divide Trail
- Historic Trail
- River or Creek
- Lake or Reservoir

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Figure 4.11-12

Wetland and Riparian Zones Impacts within Alternative 4

0 1 2 4 Miles
0 1 2 4 Kilometers
1:300,000
N

Effectiveness: By phasing the project, temporal impacts to vegetation loss would be reduced. Reclamation would be initiated and start to establish prior to the disturbance of later phases, thereby limiting the amount of time that native vegetation communities are lost. Phasing also would decrease the overall risk of spreading and introducing noxious/invasive weeds due to isolating construction to respective areas under a phased construction sequence. Finally, phasing should allow for an opportunity to use adaptive management to improve subsequent reclamation techniques and allow for the first phase of reclamation to mature sooner than it would otherwise.

Veg-1: Survey and delineate the disturbance area to minimize surface disturbance to project design limits. Actively monitor construction to ensure construction and staff stays within limits.

Effectiveness: Delineating the disturbance area will minimize the amount of disturbance by ensuring that all disturbance to vegetation is planned and intentional rather happenstance.

Veg-2: Salvage vegetative debris and redistribute to reclaimed surface areas in order to reduce erosion and preserve native organic material and seed sources.

Effectiveness: Soil found within the Application Area has relatively low productivity. Integrating slash into and onto the soil improves moisture holding capacity of the soil. As long as the amount of vegetative material is somewhat dispersed, heating through composting and nitrogen sinks will be avoided. In addition, the slash material will reduce wind and water erosion by increasing the roughness of the soil surface. In addition, there are many native plant species that are not economically feasible to collect and any opportunity to preserve and utilize this seed source will help maintain the site's species diversity during reclamation.

Veg-3: In areas where excavating soil is not necessary, such as some temporary haul road or fill, avoid disturbing native soil and root zones where possible to preserve soil structure and soil biology and improve the success for reclamation.

Effectiveness: Minimizing disturbance to the root zone helps maximize the opportunity that soil structure will remain intact and that beneficial soil microbes will be preserved. In some cases, plants can resprout from the roots, if not excessively damaged.

4.11.12 Residual Impacts

If the vegetation mitigation measures, along with the Reclamation Plan, are effectively implemented, no residual impacts are expected. Once interim and final reclamation (following decommissioning) are completed and the vegetation communities have time to mature and natural ecological functions and processes are restored, the vegetation is expected to return to pre-project conditions. However, if cushion plant communities are impacted, the experimental nature of cushion plant restoration makes residual impacts of this community uncertain.

4.11.13 Irreversible and Irretrievable Commitment of Resources

Irreversible commitments are permanent or essentially permanent resource uses or losses; they cannot be reversed, except in the extreme long-term. Once the life of the project is completed, the facilities would be decommissioned and the Application Area reclaimed. With proper soil salvage and subsoil segregation, native vegetation would grow back, so that vegetation removal would not cause irreversible impacts. It is estimated that grass and forb vegetation communities would recover within 5 years of reclamation. The recovery period for sagebrush shrublands (including vascular plants, fungi, mosses, lichen, bacteria and algae) may be much longer and is estimated to be between 15 to 50 years to reach full climax community conditions (Nelle et al. 2000; Ziegenhagen 2004). However, less mature shrubs that would be similar in size and stature would be established before that timeframe. Forested or woodland communities would recover in 20 to 100 years depending upon the current age of the existing communities. The effects of noxious and invasive species would be controlled through the diligent

implementation of the Reclamation Plan and would not be irreversible or irretrievable. If unique communities such as the cushion plant community are unable to be restored, then these impacts would be irreversible and irretrievable.

None of the alternatives are expected to result in irreversible commitment of wetland resources. An irretrievable commitment of a resource is one in which the resource or its use is lost for a period of time. An irreversible commitment of a resource is one that cannot be reversed (e.g., extinction of a species). While any of the alternatives might result in conversion of wetland to upland (e.g., if a road crosses through a wetland), this impact would be quantified through the Section 404 permit process, and mitigated typically through enhancement, restoration, or replacement. The USACE typically requires in-kind, on-site replacement of wetlands. Since any wetlands lost would be replaced, while there may be irretrievable impacts until the replacement wetland is functioning, no irreversible or irretrievable commitment of wetland resources would occur.

4.11.14 Relationship between Local Short-term Uses and Long-term Productivity

Both local short-term uses and long-term productivity would be diminished until the reclaimed areas can be restored to a mature vegetation community. These temporal losses consist of the lag time it takes to develop to pre-construction conditions, generally 5 to 20 years. In some cases, this would require plant community succession from grassland, to shrubland, to woodland, to forest. Several weed species may affect short-term uses, but long-term productivity would not likely be impacted.

Because of the measures in place that require avoidance, minimization, and mitigation of wetland impacts, long-term productivity of wetlands would not be impacted. While short-term losses of wetland could occur under any of the action alternatives, mitigation requires replacement of these wetlands, therefore, over the long-term the productivity and function of wetlands would be restored.

4.12 Impacts to Visual Resources

This section provides an assessment of the direct and indirect potential impacts to visual resources from the construction, operation, and decommissioning phases of the proposed project and alternatives. The analysis area, impact assessment methodology, scoping issues, and significance criteria are summarized below, followed by the potential impacts of the proposed project and alternatives.

4.12.1 Analysis Area

The visual resource analysis area is the visible area (viewshed) from the CCSM Application Area to a distance of 30 miles, as shown on **Figure 4.12-1**. The analysis area includes roads, recreational use areas, communities, and residences that provide views of the proposed project and alternatives. All proposed project facilities are located within the Application Area. Primary access roads that connect the project (within the Application Area) to the regional transportation network are located partially outside the CCSM Application Area boundaries, but within the analysis area.

4.12.2 Analysis Methods

Short-term visual impacts associated with construction activities and the presence of construction equipment was assessed qualitatively. Long-term impacts were assessed qualitatively and quantitatively utilizing the BLM's VRM system contrast rating process and significance criteria.

The contrast rating process compared changes to existing visual characteristics from the introduction of proposed facilities and activities. The visual contrast created between a project and the existing landscape is described in terms of form, line, color, and texture. The contrast is then compared with VRM classes to determine whether construction and operation phases of the project meet management objectives. The degree of contrast is evaluated according to the criteria shown in **Table 4.12-1**. For comparative purposes, the four levels of contrast (i.e., none, weak, moderate, and strong) roughly correspond with VRM Classes I, II, III, and IV, respectively. In other words, a "strong" contrast rating may be acceptable in a Class IV area but probably would not meet the VRM objectives for a Class III area.

Table 4.12-1 VRM Class and Contrast Ratings Criteria

VRM Class	Acceptable Degree of Contrast	Criteria
I	None	Contrast is not visible or perceived
II	Weak	Contrast can be seen but does not attract attention
III	Moderate	Contrast begins to attract attention and begins to dominate the characteristic landscape
IV	Strong	Contrast demands attention, will not be overlooked, and is dominant in the landscape

Viewshed analyses for each alternative were prepared using GIS to depict the areas that would be within views of KOPs within the analysis area, and to quantify the number of WTGs that would be visible from each KOP based on alternative conceptual layouts. The computer-generated viewshed mapping was projected from the 100-m tall nacelle of WTGs, using a 30-m USGS digital elevation model, out to a distance of 30 miles from the Application Area boundary. Due to the general absence of tall land cover that could alter the actual viewshed in this landscape, the topographically generated viewshed mapping is considered generally accurate.

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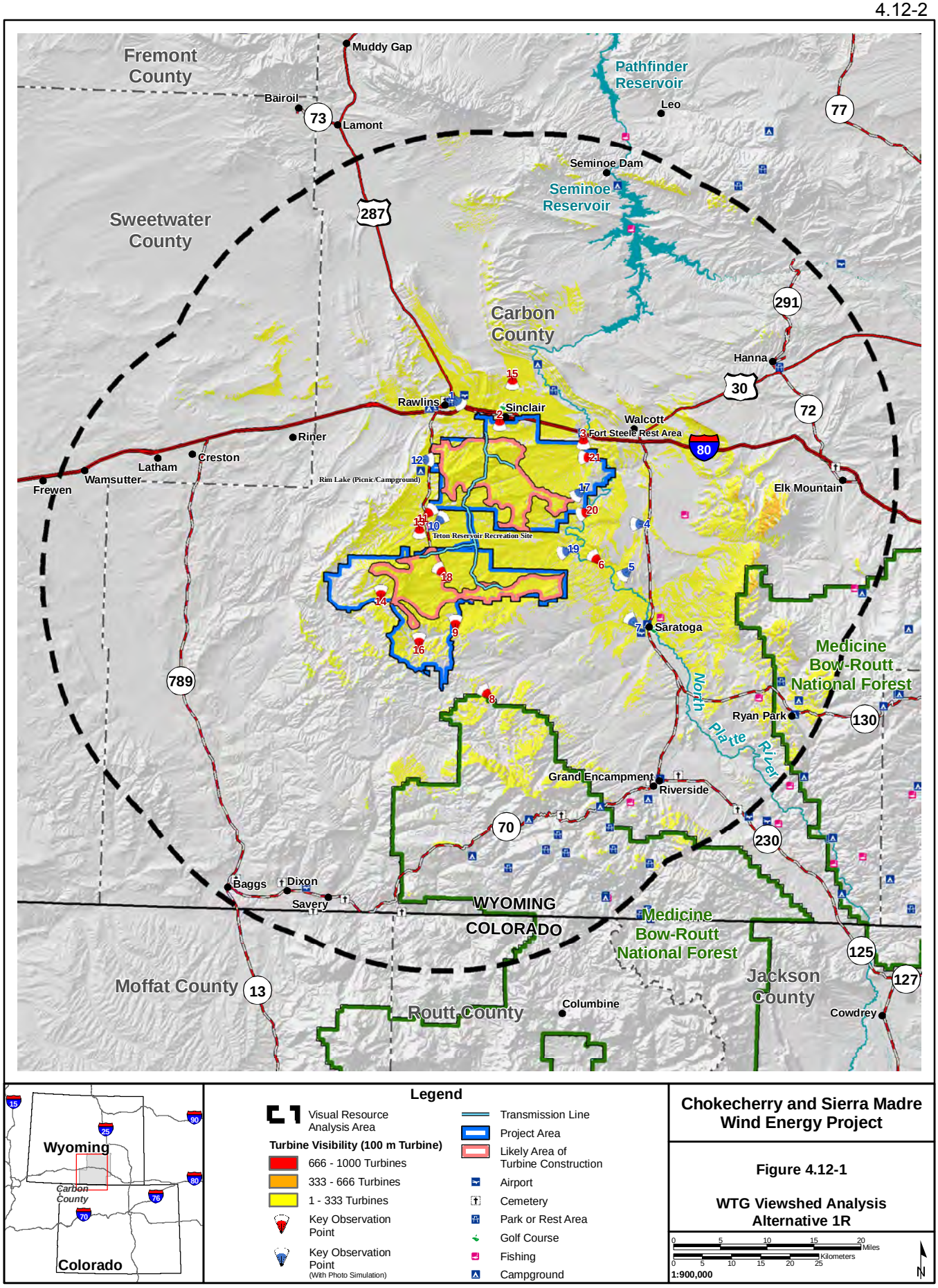

Legend

- Visual Resource Analysis Area
- **Turbine Visibility (100 m Turbine)**
  - 666 - 1000 Turbines
  - 333 - 666 Turbines
  - 1 - 333 Turbines
- Key Observation Point
- Key Observation Point (With Photo Simulation)
- Transmission Line
- Project Area
- Likely Area of Turbine Construction
- Airport
- Cemetery
- Park or Rest Area
- Golf Course
- Fishing
- Campground

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.12-1

WTG Viewshed Analysis Alternative 1R

0 5 10 15 20 Miles
0 5 10 15 20 25 Kilometers
1:900,000
N

KOPs were selected in the field with BLM resource specialists where views of the proposed project: 1) would be most visible to the public; 2) were representative of typical views and project components; or 3) were visible from visually sensitive locations, such as scenic or historic trails and other recreational use areas.

Photographic simulations of each alternative convey the overall perception of landscape changes of the four action alternatives as seen from eight KOPs, and show the scale, extent, and other characteristics of the project relative to major landscape features. Photographic simulations were based on conceptual layouts and were prepared and evaluated in accordance with BLM Handbook H-8432-1. Actual WTG sites may differ somewhat from the locations depicted in the simulations; however, the simulations are representative of the full build out scenario for each action alternative. A KOP viewshed analysis accompanies each photographic simulation to illustrate the topography and distance from the KOP to project facilities. **Appendix I** displays each simulation side-by-side with an existing conditions photograph and a KOP viewshed analysis. All photographic simulations show WTGs with a non-reflective 30 percent gray applied to evaluate the effectiveness of mitigation measure VR-5.

Contrast ratings take into account differences between photographic simulations and the actual appearance of a wind project in the landscape (University of Newcastle 2002). Photographic simulations cannot depict movement, lighting, and ever-changing environmental conditions. The human eye sees differently than a camera lens, both optically and figuratively. The focusing mechanisms of human eyes and camera lenses are different: human eyes move, and the brain integrates a complex mental image; human vision is binocular and dynamic, compared to a camera that tends to flatten an image. Furthermore, impact ratings are highly sensitive to changing atmospheric conditions and seasons. Observations of the Foote Creek Rim, High Plains, Seven Mile Hill, McFadden Ridge, and Happy Jack wind energy projects in the same physiographic region aided in a comprehensive evaluation.

BLM BMPs and ACMs were incorporated into the alternative analysis. Mitigation measures were developed to minimize or eliminate adverse impacts to the extent feasible.

4.12.3 Issues and Management Considerations

The analysis area contains major roadways, communities, residential areas, and recreation sites with a high number of potential viewers of proposed project activities. The Application Area is a popular destination for developed and dispersed recreational opportunities with residents and draws visitors from the surrounding region. Recreational uses available in the analysis area are described in Section 3.7, Recreation. The proposed project under any action alternative would result in long-term changes to the visual setting as seen from large portions of the analysis area, as well as from KOPs. The primary visual issues and concerns associated with the proposed project include:

<u>Construction</u>

- Short- and long-term visual resource changes resulting from WTGs and other aboveground facilities, power lines, project surface disturbance, and construction-generated dust as seen from public viewpoints at recreation sites and popular use areas, residential areas in nearby communities, heavily used highways, and public roads that provide access to recreational and residential uses.
- Impact of potential light sources associated with aboveground facilities.

<u>Operation</u>

- Potential changes in the existing natural and rural landscape to a landscape with a strong industrial component as seen from public viewpoints.

- Visibility of the proposed project from important recreation and scenic destinations that include the CDNST, Overland Historic Trail, North Platte River, Teton Reservoir Recreation Site, and the Rim Lake Recreation Site (**Figure 4.12-2**).

- Visual resources on public lands in the analysis area are managed for multiple uses according to the direction set forth in the Rawlins RMP/ROD (BLM 2008a). Management goals and objectives for the CDNST and the North Platte River SRMA are included in **Table 4.7-1**. Management actions designed to achieve the goals for these SMAs consider the quality of the visual resource, which provides the setting for recreational uses of these areas. The Rawlins RMP/ROD and applicable visual resource management considerations, as well as the FLPMA, are listed in **Table 4.12-2**. As summarized in Section 2.2.1.1, this analysis follows the VRM Plan Amendment preferred alternative in Volume 1.

Table 4.12-2 Relevant Management Considerations for Visual Resources

Chokecherry Sierra-Madre Wind Project EIS, Volume 1 – VRM Plan Amendment (Section 2.2)
Amends the Rawlins RMP/ROD by proposing a preferred VRM alternative for the Plan Amendment planning area.
BLM RMP and ROD – Visual Resource Management (Section 2.3.15, page 2-48)
Management Goals • Manage public lands according to VRM classes that are determined based on land use allocation decisions made in this RMP.
Management Objectives • Establish VRM classes for the Application Area. • Maintain the overall integrity of visual resource classes while allowing for development of existing and future uses.
Carbon County Comprehensive Land Use Plan - November 9, 2010 (Chapter 8: Goals and Strategies, pages 91, 92)
Management Goals • Sustain scenic areas, wildlife habitat, and other important open spaces.
Management Strategies • Undertake a countywide assessment of scenic resources to precisely identify the important scenic areas that should be protected from conflicting land uses. • Identify open space priorities and recommendations for maintaining these resources.
Management Action • Conduct a survey of county residents to ask which areas have the most important scenic value. • Develop land use standards that will maintain scenic vistas by the use of innovative subdivision design and clustering. • Support the acquisition of conservation easements on sensitive and unique scenic area. • Adopt an overlay district for open space, scenic, and wildlife areas

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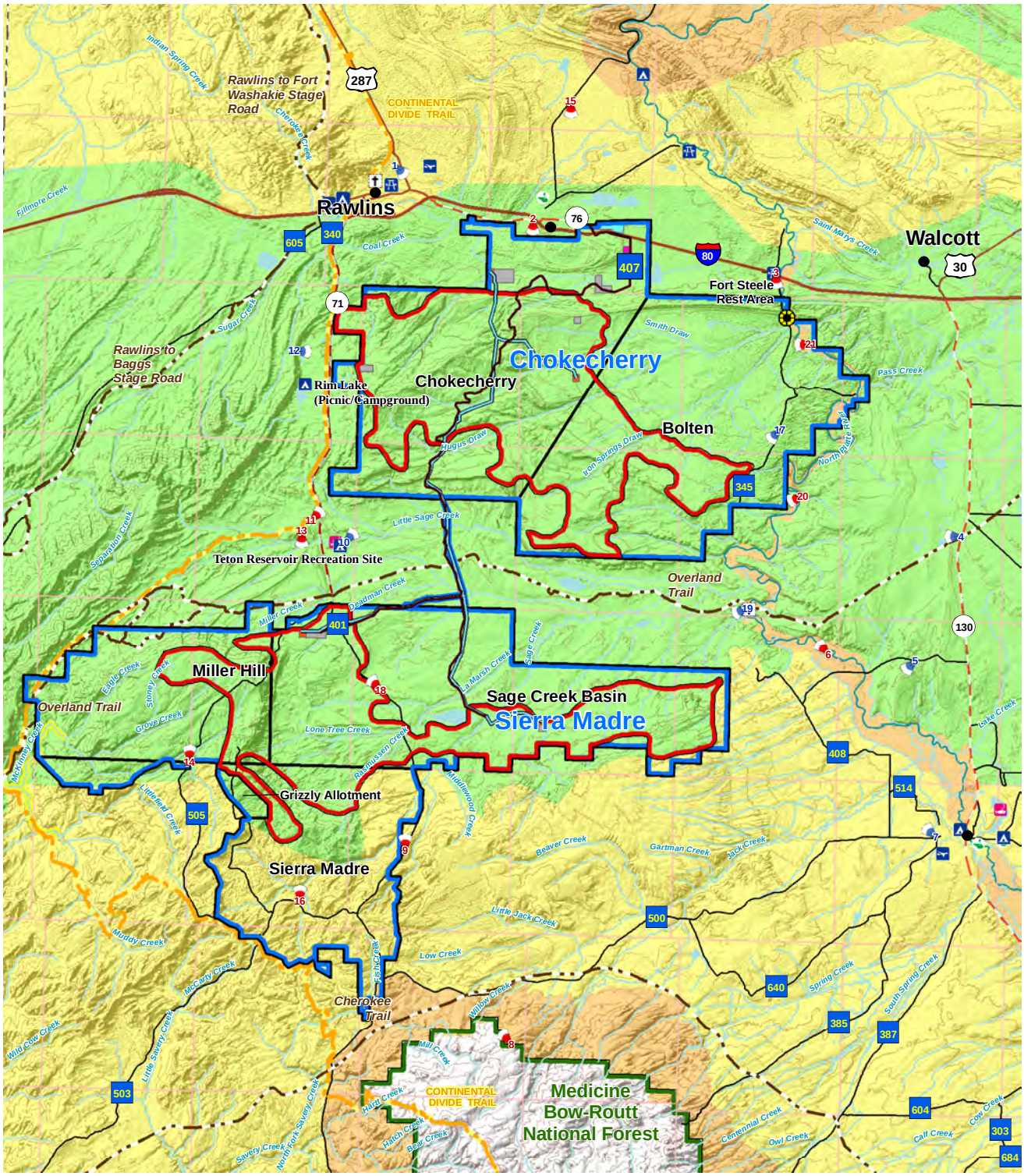

Legend

- Project Area
- Project Subarea

Visual Resource Management

- Class II
- Class III
- Class IV
- Key Observation Point
- Key Observation Point (With Photo Simulation)
- Water Extraction Site
- Transmission Line
- Haul Road
- Alternate O&M Facility
- Intermodal Rail Facility
- Staging Area (Construction Only)
- Substation
- Likely Area of Turbine Construction
- Airport
- Cemetery
- Park or Rest Area
- Golf Course
- Fishing
- Campground
- Continental Divide Trail
- Historic Trail

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.12-2

Visual Resource Management Classes Alternative 1R

0 1 2 4 Miles
0 2 4 8 Kilometers
1:350,000
N

Assumptions

The following assumptions were used in the analysis for visual resources:

- All action alternatives would result in visual change to the analysis area because most project components would be visible from some location, however remote;
- Assumes WTG locations are conceptual and subject to change after the ROD is issued;
- Assumes the assessment is being completed at a hybrid or programmatic level. Additional NEPA analysis will be necessary for all project components after the ROD is issued. One outcome of the hybrid approach is to better define the resource constraints, standard practices, and mitigation measures that all future NEPA analyses will depend on;
- Assumes most impacts to the recreational experience are of a visual nature and will be addressed in the visual resource section;
- Visual impacts to historic trails and context-sensitive cultural sites are addressed in Section 4.2, Impacts to Cultural Resources; socioeconomic impacts related to visual impacts are addressed in Section 4.8, Impacts to Socioeconomics.
- For purposes of this analysis, potential effects or impacts are considered either construction or operation related. Construction-related impacts are assumed to be short-term and visible during construction activities of up to 4 years; operation-related impacts are assumed to be long-term and visible for the duration of the operation phase of the proposed project. Most impacts to the recreational experience are of a visual nature and are addressed in this section as direct effects to visual resources; and
- The evaluation assumes that ACMs and BMPs would be successfully implemented (e.g., roads would be designed and constructed in accordance with the BLM Gold Book design criteria). According to the applicant's POD, operators would monitor and maintain visual mitigation measures for the approved project in accordance with a visual monitoring and compliance plan.

Significance Criteria

There is a wide and diverse range of opinions on the visual significance of wind energy effects, explained by the complexity and the subjectivity of the issues; the meanings attributed to renewable energy; the desire of one set of wind interests to minimize the political, professional, and public perception of the landscape effects of wind projects; and an opposing desire by another set of interests to maximize these perceptions. A goal of the BLM VRM system is to objectively quantify the changes introduced by a project compared to existing conditions and management objectives, with the bias that natural-appearing landscapes (i.e., existing conditions) are more appealing to viewers.

Significance criteria were based on the issues identified in Section 4.12.3, Issues and Management Considerations, from public and agency scoping, and from a literature review of issues associated with similar projects.

A significant impact to visual resources would occur if:

- Development has a substantial adverse effect on a designated scenic vista;
- Development substantially alters the existing scenic quality of a Class A scenic landscape;
- The project would be incompatible with the designated VRM class objective; and
- Development creates a new source of substantial light or glare that would adversely affect day or nighttime views in the analysis area.

4.12.4 Impacts to Visual Resources from the No Action Alternative

Under the No Action Alternative, there would be no anticipated impacts to visual resources as the proposed project would not be developed. Under this alternative, the project would not be developed on BLM lands, or access to private lands for wind energy projects. Furthermore, the State of Wyoming would restrict development on private and state lands in the Application Area. Existing management and recreational activities and other uses of the Application Area would continue.

4.12.5 Impacts to Visual Resources from Alternative 1R, Applicant Proposed Alternative

Alternative 1R, Applicant Proposed Alternative, consists of aboveground and underground facilities. Viewpoints within the analysis area (including roadways, recreational use areas, and residences) would experience visual impacts from 1,000 WTGs and ancillary aboveground facilities, including transmission lines, substations, step-up transformers, overhead electric collection lines, roads, an IRF, and the O&M facility. Underground facilities include electric collector lines and communication lines that connect individual wind turbines and WTG foundations.

Direct effects to visual resources occur as a result of the disturbance of the landscape by project activities and the addition to the landscape of proposed facilities. Direct effects can be short- or long-term. Indirect effects caused by the proposed project occur later in time or farther removed in distance, and would likely involve indirect changes in the local economy from visibility of facilities.

Short-term effects result from temporary disturbances, such as the initial monitoring and testing activities, and construction and installation activities. Visual impacts related to underground cables are limited to short-term construction impacts.

Long-term effects result from the addition of permanent structures to the landscape and from operation of facilities. Facilities that would contribute to long-term effects include WTGs, substations, new and reconstructed WTG internal resource roads, reconstructed primary access roads, O&M facility, IRF, overhead electric collection system, step-up transformers, and transmission lines. Effects from long-term disturbance would occur for the duration of the operation phase of the proposed project. The most substantial impacts would occur from the addition of WTGs to the landscape and disturbances resulting from grading and vegetation removal on WTG pad areas and roads.

<u>Short-term Effects</u>

Short-term direct and indirect effects to the visual character of the analysis area would occur from the transport of WTGs and other supplies and equipment on public roadways through the Application Area from the IRF; the construction of WTG pads and installation of WTGs; and construction of ancillary facilities, including step-up transformers, underground and overhead electric collection and communication lines, roads, transmission lines, electric substations, IRF, O&M facility, and staging areas. Temporary facilities and disturbances associated with construction activities include staging areas and the presence of construction equipment and vehicles, which would impact the visual resource for the duration of the 4-year construction period. Construction equipment, the sequence of construction and installation activities, and the anticipated schedule of events for each year of the POD construction phase are summarized in Section 2.2, Project Elements Common to All Alternatives. According to the POD, all road construction would occur in Year 1 even though the remaining aboveground facilities may not be installed for 1 to 3 years later which would potentially increase the duration of dust effects. Constructing roads more than 1 year in advance of the remaining facility installation activities would increase the duration and intensity of visual impacts (i.e., dust, landscape fragmentation), and potentially decrease the likelihood of reclamation success. Short-term direct effects also include decommissioning activities following completion of the operating phase. The visual impacts from decommissioning activities are similar to construction.

Fugitive airborne dust that settles on vegetation would potentially reduce plant growth, which may further alter the natural character of the Application Area. The BLM has issued dust restrictions for minerals development in the BLM planning area that indicates that dust would be considered controlled when: 1) no dust is generated above the cab of the vehicle; or 2) there are no hanging dust plumes. Implementation of these restrictions using appropriate dust control measures would substantially reduce the visual impact of fugitive dust during the construction phase of the proposed project (Jones and DeMille Engineering 2008).

The following major short-term activities associated with Alternative 1R would affect visual resources:

- Clearing, grading, and restoration of the construction disturbance areas for roads, transmission line construction ROW, WTG pads, truck turnaround areas, and staging areas. The total initial disturbance of 7,221 acres accounts for 3.3 percent of Alternative 1R;
- Assembly and installation of 1,000 WTGs;
- Construction of other aboveground facilities (step-up transformers, underground and overhead electric collection and communication lines, transmission lines, electric substations, IRF, O&M facility);
- Increased vehicle traffic for worker access and large construction equipment (e.g., trucks, excavators, cranes). Increased traffic would produce visible activity and dust from disturbance of dry soils, which would impair viewing distances and coat vegetation;
- Increased human presence from the workforce at construction sites and staging areas within the Application Area; and
- Decommissioning activities.

Temporary construction disturbance from the construction of new access roads and internal resource roads, and the reconstruction of existing roads, WTG pads, truck turnaround areas, and staging areas would be visible as light-tan exposed soils in geometrically shaped areas with straight, linear edges that provide some textural and color contrasts with the surrounding undisturbed vegetation. The construction disturbance width of internal resource roads is assumed to be 94 feet wide, depending on the terrain). Roads located on steep slopes may require wider construction disturbance due to the cuts-and-fills required for road construction on slopes (the cut-and-fill slope required for the Miller Hill Road would be 1,000 feet, which is the largest required on the project). Large cuts-and-fills required for roads and WTG pads on steep slopes that face viewers would create cleared areas with strong color, line, and form contrasts that would be easily visible to viewers located at KOPs until the disturbed areas are successfully reclaimed. According to the construction schedule in Section 2.2, Project Elements Common to All Alternatives, all road construction would occur in Year 1 even though the remaining aboveground facilities may not be installed for 1 to 3 years later. Once construction and installation activities are completed, construction disturbance areas would be reclaimed back to the long-term, operation phase disturbance areas except for the internal resource haul road. Reclamation procedures would minimize the visual impact from construction disturbances by restoring plant cover and species composition of disturbed sites to pre-project conditions. Section 2.3.2, Alternative 1R, Applicant Proposed Alternative, provides the short-term disturbance acres from construction activities for each surface disturbing activity under Alternative 1R.

Visual impacts from construction equipment and activities would consist of visible large trucks, semi-tractors, and trailers delivering facility components to facility sites and staging areas, earthmoving equipment at facility locations, and assembly and installation activities. Equipment that may provide noticeable line, color, texture, and form contrasts with the characteristic landscape (as seen from KOPs) include cranes, large trucks used to haul equipment and supplies, construction and earthmoving equipment, and batch plant facilities.

WTG components (towers, blades, and nacelles) would be transported to each pad site on trucks, semi-tractors, and trailers, and unloaded using various crane types and sizes. Each WTG would require the use of seven to eight large cranes. Due to the rate of part delivery and construction phasing, no site pad would require more than two cranes at any given time. The scale, form, and motion of large cranes required to install WTGs can be visible for several miles, and creates strong vertical and diagonal linear contrasts with the dominant horizontal and rolling lines of the landscape for the duration of construction activities. The visibility of cranes and location within the Application Area with increasing distance relative to the viewer would be dependent on size and the color selected for the cranes. Safety colors, such as orange, would create a strong contrast with surrounding vegetation and soil colors. While the impact of cranes and WTG assembly at any one site would be of relatively short duration, the overall impact of WTG assembly in all parts of the WTG areas over a 4-year period would be high. The impact from construction activities would be mostly from sites where low-profile activities would be within the viewsheds of communities, transportation routes, and recreation areas. The construction sites visible in these viewsheds occur mostly at the perimeters of the project footprint, and in larger public land blocks south of T18N, and would be visible from a relatively small percentage of the visual resource analysis area. Project-related traffic within the Application Area would consist of frequent daily trips made by trucks hauling WTGs and other large equipment, earth-moving equipment and cranes, and small vehicle traffic for construction workers. Project traffic hauling WTG and other large components would be obvious and intermittently intrusive to motorists on WY 71, CR 345S, and other Application Area roadways with views of activities in the analysis boundary for the duration of construction activities. Airborne dust from moving vehicles on existing dirt and gravel roads, as well as from construction activities, would be visible to viewers throughout the analysis area during construction periods.

Evidence of increased human presence from the workforce at construction sites and staging areas within the Application Area would be visible from KOPs and other public viewpoints, primarily from the movement of construction equipment and equipment hauling vehicles on analysis area roadways, and the sights of equipment involved in construction and installation activities.

Short-term visual impacts from installation of aboveground facilities would be limited in spatial extent to specific development sites within the Application Area at any one time during the 4-year construction phase. Construction and reclamation activities would take place concurrently in different locations within the Application Areas. Apart from road construction in Year 1, construction activities scheduled for each year would concentrate on the full development of WTGs at site facilities within specific development areas within the Alternative 1R area. Once facilities have been installed, facilities can be brought online once the main transmission line has been completed and tied into the regional grid. Therefore, over a 4-year period, some WTGs will be rotating while other WTG are constructed or await project completion. Reclamation activities would take place in areas where construction activities are complete as soon as practicable. The POD assumes that reclamation would follow construction activities within a maximum period of 1 year.

When the project lifespan is completed and decommissioning becomes necessary, all facilities would be removed. Ground disturbance associated with complete decommissioning of the project will be similar to the ground disturbance associated with construction of the project. Reclamation procedures would include regrading, spreading topsoil, and revegetating all disturbed areas. Visual impacts from decommissioning are similar to those described for construction activities.

All surface disturbing activities would result in direct adverse visual impacts. The scale of surface disturbing construction activities and visibility from sensitive viewpoints (including historic and scenic trails, popular recreation sites, residential areas, and communities) over a 4-year period would result in adverse short-term visual impacts in the Alternative 1R analysis boundary. The impacts to visual resources are substantial in that construction activities would be visible to some sensitive viewpoints; however, current BLM VRM objectives for Class IV, or the VRM Plan Amendment preferred alternative in Volume 1, would be met during the 4-year construction phase.

Lighting Impacts

Some construction activities would occur during day and night work shifts. The work area would be lighted at night with portable lighting powered by a diesel-fueled generator. Construction lighting is not described in detail in the POD. Direct or indirect light sources would still be visible from specific KOPs. The degree of contrast associated with nighttime lighting depends on the proximity to KOPs (viewing distance), elevation of lighting relative to KOPs (most lighting will likely be located on WTG pads at higher elevations than viewers), the intensity of specific lighting sources, and the background or ambient level of combined nighttime lighting in the study area. Short-term impacts from the use of exterior lighting for nighttime safety and security during construction at proposed project facilities may contribute substantially to ambient nighttime lighting conditions. However, given the anticipated duration of construction-related lighting, any impacts to nighttime scenic quality would be temporary. Over the 4-year construction phase, construction lighting would occur intermittently as cranes would be lighted; lighting effects would not be significant.

4.12.5.1 Long-term Effects

Long-term effects for the project would result from the addition to the Application Area landscape of 1,000 WTGs and ancillary operational facilities that include transmission lines, substations, step-up transformers, underground and overhead electric collection and communication lines, roads, IRF, and O&M facility. Operations facilities would introduce new elements into the landscape and would create new contrasts with the existing landscape form, line, color, and texture that would be visible from KOPs over the operating life of the proposed project.

The following major long-term activities associated with Alternative 1R would affect visual resources:

- Visibility of large-scale WTGs from large portions of the analysis area at distances of up to 30 miles;
- Contrasts associated with WTG pad disturbance, which have the potential for strong contrasts from cut-and-fill areas on slopes with a grade of 7.5 percent or greater;
- Visibility of transmission line, which would be a large-scale linear feature constructed in new and existing ROWs;
- Contribution of overhead collector lines located along proposed internal resource roads to visual clutter;
- Contrasts associated with new access roads and internal resource roads, which have the potential for strong contrasts from cut-and-fill areas on slopes with a grade of 7.5 percent or greater;
- Visual impact of aboveground facilities located on private lands. Facilities proposed for development on private land include substations, IRF, and O&M facility; and
- Day and nighttime lighting of WTGs in accordance with FAA standards as a source of substantial light or glare, which would adversely affect day or nighttime views in the analysis area and could be seen from large portions of the analysis area.

Indirect effects from Alternative 1R could occur if adverse changes to the scenic quality of the landscape made the area a less desirable location for recreation, resulting in a loss of tourist or other recreation related revenues to local economies. The effects of the proposed project on trail uses, hunting, and other recreational opportunities in the analysis area are described in Section 4.7, Impacts to Recreation.

WTGs

Under Alternative 1R, 1,000 WTGs would be sited on ridgetops and benches over large expanses of the CCSM areas. The introduction of WTGs into the area landscape would create new straight-edged

vertical lines, angular forms, and pale colors that would contrast with the horizontal, undulating landforms and seasonal vegetation colors and textures of existing natural and rural landscapes. The 100-m class WTG model considered for use would be mounted on a single steel self-supporting tower, a maximum of 328 feet high, and anchor-bolted to a concrete foundation. Each WTG rotor would have three blades that would each be a maximum of 183 feet in length (depending on model selected). Overall height after construction would be approximately 511 feet from the ground to the tip of a vertical WTG blade. The WTGs would be painted a standard color of 5 percent gray, which is an off-white color. Multiple models and manufacturers of WTGs could be procured for the project; however, differing heights of WTGs are unlikely to alter the perceived visual effect that would occur from a single model. This is because WTGs are sited on varying elevations through the analysis boundary.

The large scale of individual WTGs, coupled with the large number of WTGs located in the Alternative 1R area, results in a high degree of visibility for much of the analysis area. WTGs would be prominent in views of landscapes in foreground distance zones up to 0.5 mile from viewpoints, and would dominate most other landscape elements. Views of WTGs in foreground-middle ground distance zones up to 5 miles from viewpoints would be variable, with WTGs appearing prominent in the closer views and subordinate to other landscape features at the further reaches of the distance zone. WTGs in this distance zone are perceived as part of a larger landscape context, but would be easily visible in unobstructed viewsheds. WTGs may be visible in background views at 30 miles from viewpoints under optimal atmospheric conditions; however, they would be minor elements relative to the scale and complexity of a larger panorama.

The visual impact from the rotation of WTG blades includes effects of shadow flicker and blade glint. Shadow flicker refers to the shadows that a WTG casts at those times of the day when the sun is directly behind the turbine rotor from an observer's position. Shadow flicker is most pronounced when the sun is positioned at lower angles in the sky, which occurs during brief periods at sunset and at sunrise, and in northern latitudes during winter months. A study that evaluated the effects of shadow flicker concluded that the nearest affected receptors should be no closer than 10 rotor diameters from the WTGs (ARM Group Inc. 2009). There would be no WTGs located within 3,675 feet of any KOP evaluated for Alternative 1R. WTGs would be located within 3,675 feet on segments of WY 71 in the CCSM areas; however, viewers on these roads would be moving and affected by shadow flicker for only brief periods of time. Blade glint is the reflection of sunlight off the surfaces of rotating blades. Each WTG rotor would have three blades made of fiberglass epoxy or polyester resins. Blade surfaces made from these materials are generally dull relative to older metal composite blades. There would be minimal, if any, blade glint from WTG rotor blades.

Color, line, and textural contrast of operating WTG pads would be visible in unobstructed views from KOPs with contrasts that would be low to high, depending on the density and seasonal color of the surrounding vegetation. Pad clearings would be visible as light-tan exposed soils in geometrically shaped areas, with straight linear edges that provide some textural and color contrasts with the surrounding undisturbed vegetation. Pad clearings would be difficult to discern from the surrounding landscape in middleground views of more than 1.5 to 2 miles from viewpoints. This is because the existing characteristic vegetation of the analysis area consists of low, sparse grasses and shrubs that provide little contrast to the native soils during most of the year. Color contrast between disturbed areas and the surrounding vegetation would be the most pronounced during the spring months, when the vegetation is green. Color contrasts between vegetation and soils tend to be low during the remainder of the year, when the vegetation is varying shades of gold and tan. WTG pads constructed on steep slopes would increase the potential for visibility. Cut-and-fill slopes generally have straight linear edges that exaggerate the color contrast between bare soils against the surrounding vegetation. A slope of 7.5 percent or greater would require vertical cut-and-fill areas of 22 feet or greater in height. The effects from cut-and-fill disturbances on slopes that face KOPs and viewers at other locations would be visible for long distances until the slopes are successfully revegetated.

Groups of WTGs would be visible from many roadways, recreational use areas, communities, and residences within the analysis area. The degree of contrast between proposed WTGs and other surface facilities with the existing landscape was evaluated for KOPs that represent views seen from each of these areas. **Table 4.12-3** summarizes the impacts to viewers at 21 KOPs from Alternative 1R, as well as other action alternatives. The table provides a range of the number of WTGs that would be visible from each KOP and presents the degree of contrast with the existing landscape for each alternative as seen from each KOP. The table summarizes the results of a contrast rating analysis prepared for each KOP. **Table 4.12-4** provides the number of WTGs in BLM VRM Class IV areas and breaks out the number of WTGs that would be located on steeper slopes. **Figure 4.12-1** provides a viewshed analysis that shows the number of WTGs that would be visible under Alternative 1R long-term activities.

Access into the Application Areas and WTG sites would be on existing roads (including two-track primitive roads) and new roads. Internal resource roads would provide access to each WTG location from an internal haul road. Haul roads, internal resource roads, and transmission line O&M roads would accommodate large haul trucks and cranes. Once construction activities are complete, all project roadways would be reclaimed back to a driving width of 20 feet to accommodate O&M vehicles except in the main internal haul road.

Color, line, and textural contrast of new road disturbance, and associated cut-and-fill slopes would be visible in unobstructed views from KOPs. The contrasts would be similar to those described for WTG pads; however, internal resource roads would be visible as a linear feature. **Table 4.12-5** summarizes the miles of interior resource road grouped by required road grade in BLM VRM Class IV areas. Road disturbances would be difficult to discern from the surrounding landscape in middle ground views of more than 2 miles from viewpoints, as the soil colors would tend to blend with the surrounding vegetation.

One objective of the Chokecherry and Sierra Madre Wind Resource Area Reclamation Plan is to re-establish visual composition and characteristics. The visual composition and character would be mitigated by contour grading and specific plant community based reclamation seed mixes so that the overall form, line, color, texture, structure, scale, and location and orientation of major landscape features will replicate pre-construction conditions and blend into surrounding plant communities, and topographic diversity will be re-established. Implementation of the Reclamation Plan would be highly effective in restoring land contours to a condition that replicates pre-existing landforms, and in reducing visual contrasts from disturbed soils.

Transmission Lines

The proposed double circuit 230-kV overhead transmission line would transmit the wind-generated electricity from the electric collector substations to the national electric grid interconnection at the 500-kV substation located at the north end of the Chokecherry site. Under Alternative 1R, the transmission line would be constructed in 33 miles of new, previously undisturbed ROW that extends south from the 500-kV substation to a collector substation in the Sierra Madre Application Area along the proposed internal haul road. As seen from most KOPs, roadways, and recreational use areas and residences, the straight lines and angular, vertical forms of the transmission line structures would be a low to moderate contrast with the surrounding landscape because the structures are generally more than 2 miles from most viewpoints. The proposed lattice structure would be small in scale relative to the surrounding landscape, and is therefore subordinate to the overall scale of the landscape. The vertical form and straight lines of the lattice structures are visible but difficult to discern from the surrounding landscape and do not attract the attention of the casual observer. In addition, the analysis area provides a backdrop that screens the structures to some degree. The angular lines of the structures become more indistinct against the stippled texture and green to tan colors of ridge slopes, as the backdrop slopes are visible through the lattice. The visual contrast of the lattice structures, as seen from most KOPs, is weak to moderate.

Table 4.12-3 Visual Resource Objective Consistency by KOP

KOP#	Location	Heading	VRM of KOP Viewshed	Contrast Rating	Photo-simulation	Alternative Contrast Rating				VRM Class Achieved for Each Alternative				Visual Resource Issue
						Alt 1R	Alt 2	Alt 3	Alt 4	Alt 1R	Alt 2	Alt 3	Alt 4	
1	Rawlins Recreation Center	SE	IV	X	X	strong	strong	strong	strong	yes	yes	yes	yes	Recreation; also representative of views seen from residences in the Rawlins community
2	Sinclair I-80 Overpass	S	IV	X		strong	strong	strong	strong	yes	yes	yes	yes	Large number of viewers on I-80
3	I-80 Fort Steele Rest Stop	SE	IV	X		moderate	strong	strong	strong	yes	yes	yes	yes	Recreation, large number of viewers on I-80, special management area (North Platte River)
4	State Highway 130 at Overland Trail Historical Marker	W	II, III, IV	X	X	moderate	moderate	moderate	moderate	yes	yes	yes	yes	Special management area (historic trail), motorists on highway
5	Access Road to Pick Bridge Public Access Area	SW	II, III, IV	X	X	strong	strong	strong	strong	yes	yes	yes	yes	Recreation
6	Sanger Public Access Area	NW	II, III, IV	X		strong	strong	strong	strong	yes	yes	yes	yes	Recreation, special management area (North Platte River)
7	West of Saratoga - CR 385 at CR 500	NW	II, III, IV	X	X	moderate	moderate	moderate	moderate	yes	yes	yes	yes	Motorists on local roads
8	Forest Service Road 542 at USFS Boundary	NW	II, III, IV	X		moderate	moderate	moderate	strong	yes	yes	yes	yes	USFS roadway, scenic driving

Table 4.12-3 Visual Resource Objective Consistency by KOP

KOP#	Location	Heading	VRM of KOP Viewshed	Contrast Rating	Photo-simulation	Alternative Contrast Rating				VRM Class Achieved for Each Alternative				Visual Resource Issue
						Alt 1R	Alt 2	Alt 3	Alt 4	Alt 1R	Alt 2	Alt 3	Alt 4	
9	CR 71 Kendt Reservoir Overlook	N	III, IV	X		strong	strong	strong	strong	yes	yes	yes	yes	Recreation, motorists on local road
10	Teton Reservoir Campground	NE	IV	X	X	strong	strong	strong	strong	yes	yes	yes	yes	Recreation
11	CDNST towards Chokecherry	NE	IV	X		strong	strong	strong	strong	yes	yes	yes	yes	Special management area (CDNST), recreation
12	CDNST above Rim Lake	E	IV	X	X	strong	strong	strong	strong	yes	yes	yes	yes	Special management area (CDNST), recreation
13	CR 3301 - Bridger Pass Road along CDNST	S	III, IV	X		strong	strong	strong	strong	yes	yes	yes	yes	Special management area (CDNST), motorists on roadway
14	CR 505 - Edge of VRM II Boundary on Miller Hill	N	IV	X		strong	strong	strong	strong	yes	yes	yes	yes	Motorists on roadway
15	Seminoe to Alcove Scenic Byway BLM Kiosk	S	III, IV	X		Moderate	Moderate	Moderate	moderate	yes	yes	yes	yes	Motorists on roadway, scenic byway
16	Access road - homes in Sage Creek Basin	N	III, IV	X		strong	strong	strong	strong	yes	yes	yes	yes	Residential
17	CR 345 SW Savage Hills	SW	IV	X	X	strong	strong	strong	strong	yes	yes	yes	yes	Recreation, motorists on roadway
18	WY 71 near La Marsh Creek	NW	IV	X		strong	strong	strong	strong	yes	yes	yes	yes	Motorists on roadway

Table 4.12-3 Visual Resource Objective Consistency by KOP

KOP#	Location	Heading	VRM of KOP Viewshed	Contrast Rating	Photo-simulation	Alternative Contrast Rating				VRM Class Achieved for Each Alternative				Visual Resource Issue
						Alt 1R	Alt 2	Alt 3	Alt 4	Alt 1R	Alt 2	Alt 3	Alt 4	
19	Pioneer Cemetery above Overland Trail crossing N. Platte River	W	II, III, IV	X	X	strong	strong	strong	strong	yes	yes	yes	yes	Special management area (historic trail, North Platte River), cultural resource site
20	Cherokee Historic Trail Crossing	SW	II, III, IV	X		Weak	Weak	Weak	weak	yes	yes	yes	yes	Special management area (historic trail, North Platte River), cultural resource site
21	Rochelle Recreation Area, 3.5 miles south of Fort Steele	W	II, IV	X		strong	strong	strong	strong	yes	yes	yes	yes	Special management area (North Platte River), recreation

Contrast Rating Forms are available for review in the BLM RFO.

Table 4.12-4 WTG Impacts to VRM Class IV Objectives

Management Direction	Alt 1R	Alt 2	Alt 3	Alt 4
	Percent of WTGs[1]			
BLM – VRM Class IV Lands	45	39	43	0
State	4	3	2	0
Private	51	59	54	100
Total[2]	**100**	**100**	**100**	**100**
	Percent of WTGs > 7.5% grade			
BLM – VRM Class IV Lands	45	41	45	0
State	6	3	3	0
Private	49	56	52	100
Total[2]	**100**	**100**	**100**	**100**

[1] Percent of WTGs in VRM class areas are estimates based on alternative conceptual designs.

[2] Discrepancies in totals due to rounding.

Table 4.12-5 Internal Resource Road Impacts to VRM Class IV Objectives

Management Direction	Alt 1R	Alt 2	Alt 3	Alt 4
	Percent of Roads Crossing VRM Class IV Lands			
BLM – VRM Class IV Lands (all grades)	40	37	39	27
Internal resource roads < 5% grade	26	25	26	19
Internal resource roads 5-10% grade	5	4	4	3
Internal resource roads > 10% grade	10	8	9	6
State (all grades)	5	3	3	3
Private (all grades)	55	60	58	71
Total[1]	**100**	**100**	**100**	**100**

[1] Discrepancies in totals due to rounding.

The transmission line would cross the Overland Trail and WY 71 in the Sage Creek Basin conceptual area of development. The transmission line structures would dominate foreground views within an approximate 1- to 2-mile distance of the trail and road crossing. The lattice structures would be large in scale with considerable internal complexity of form and line, resulting in a strong degree of contrast with the surrounding landscape. Beyond an approximate 1.5-mile distance, the lattice structure tends to blend with the surrounding environment. The landscape behind the structure is visible through openings in the lattice, which renders the internal clutter of lines increasingly indistinct with increasing distance. The lateral east-west extension of the transmission line would parallel the trail at an approximate distance of 1 mile between the trail and transmission line, from the tie-in with the main transmission line and a substation located west of WY 71. Structures would be set back from the crossing to the extent practicable.

Collector Lines

A combination of underground and overhead collector lines would connect WTGs with three collector substations. The collection system would be primarily underground where practicable. For the purposes of analysis, it is assumed approximately 15 percent of the collection system could be overhead line construction. Visual impacts from the underground lines would be located within the initial road disturbance and limited to short-term construction impacts. Long-term visual impacts from multiple, parallel overhead electric lines would occur from the introduction into the landscape of straight, vertical lines of individual poles placed at regular intervals along internal resource roads. The poles that would be selected for the proposed project would be either wood poles or steel wood pole equivalents. The individual poles would be erected at somewhat regular intervals, which would create a regularity of texture that would contrast with the irregular, clumping forms and textures of the surrounding vegetation. The brown color of the wood poles would harmonize with the colors of the surrounding soil and vegetation, so that the contrasts in color would be decreased. Steel wood pole equivalents also may be selected, which would present greater contrasts with the surrounding environment from the color and metallic sheen of poles until the treated poles develop a dark-brown patina. The span between the poles would be between 300 feet to 500 feet, as determined by the terrain. In addition, there may be a glare when sunlight is reflected from the conductors. The addition of the overhead electric collector lines into the natural-appearing landscape of the Application Areas, as viewed from most KOPs and other viewpoints, would constitute a visual intrusion that would be small in scale relative to the surrounding WTGs; however, the potential large numbers of poles in close proximity to WTGs and other project components would increase the overall visual clutter of those portions of the Application Area occupied by proposed wind farm components. The estimated miles of collector lines in the CCSM areas that would affect VRM Class IV are shown in **Table 4.12-6**.

Table 4.12-6 Overhead Collection System (34.5 kV)

Overhead Collection System (34.5 kV)		Alt 1R	Alt 2	Alt 3	Alt 4
		Percent of Overhead Lines Crossing VRM Class IV Lands			
Chokecherry					
VRM Class IV Lands	BLM	22	24	25	27
	State	27	36	36	36
	Private	1	1	1	1
	Subtotal[1]	**50**	**62**	**62**	**64**
Sierra Madre					
BLM – VRM Class IV Lands	BLM	19	12	12	12
	State	3	2	2	1
	Private	28	23	23	23
	Subtotal[1]	**50**	**37**	**37**	**36**
Offsite		0	1	1	0
BLM – VRM Class IV Lands	Private	0	1	1	0
	Subtotal[1]	**0**	**1**	**1**	**0**
Total[1]		**100**	**100**	**100**	**100**

[1] Discrepancies in totals due to rounding.

Other Aboveground Facilities

Other ancillary operational facilities include substations (including step-up transformers), IRF, and O&M facility. These facilities would be developed in sections consisting of private surface within the overall checkerboard surface ownership pattern characteristic of most of the analysis area. Long-term visual impacts include adverse changes in the existing landscape setting from the removal of mature vegetation and the intrusion of permanent aboveground facilities into the views seen from KOPs, as well as from sensitive viewpoints on analysis area roadways, recreation areas, and trails. In general, ancillary aboveground facilities have a considerably lower profile than the WTGs, and would present a smaller impact as viewed from KOPs relative to WTGs. Facilities that are sited on ridges at higher elevations within the development areas would generally be screened from view by intervening landforms from KOPs, most roadways, residential areas, and recreation sites located at lower elevations.

Potential substation sites are located within unobstructed viewsheds of CR 345 and CR 347S overlooking portions of the Chokecherry area, WY 71 overlooking portions of the Sage Creek conceptual area of development, and the CDNST and Overland Trail looking towards Sage Creek in the Sierra Madre Application Area. Substations would include electrical facilities and supporting infrastructure. The tallest structures in each substation would be lightning rods and 230-kV transmission line structures with heights up to 100 feet, depending on the type of structure that is selected for Alternative 1R. An 8-foot chain-link fence with barbed wire on top would surround the substation pad. The electrical and other facilities would be in close proximity to each other within the 15-acre footprint (35-acre footprint for the 500-kV substation), and would present a mass of complex, angular structures with straight lines and varying heights that would be obvious within the foreground-middle ground distance zone of roadways in the analysis area. As seen from WY 71 in the Sierra Madre conceptual area of development, a potential substation would dominate views in the foreground distance zone, blocking a high quality view to the east of the highway, and would be a strong visual impact. The visual contrast from substation structures and fencing with the surrounding landscape would be reduced by painting the structures with shadow gray from the BLM Environmental Color Chart. Painting the perimeter fence with colors that harmonize with the surrounding vegetation and soils would reduce the impact to motorists on the road.

The operation of new substations may result in a new source of light and glare from night lighting. Materials used to construct the substation may be a source of glare during the day time as well; however, it is expected that substation facilities would be constructed with no reflective materials. Night lighting at substations is not described in the POD; however, it is likely that lighting would be installed near major electrical equipment and at entrance gates. The installation of lights that use directional shielding would reduce the visibility on night lighting.

As viewed from KOPs that provide views of the Sierra Madre, Chokecherry, and Bolten conceptual areas of development (**Figure 4.12-2**), which are further in distance, the substations would be a minor blockage of a high quality view, resulting in low to moderate visual impact. Painting the perimeter fences with colors that harmonize with the surrounding vegetation and soils would minimize the visibility of substations.

An IRF for receiving shipments of WTG components may be constructed on a privately owned parcel north of I-80, near the I-80 Exit 221 east of Sinclair. If an IRF is not constructed, then all WTG components would be transported to the project sites via trucks and semi-tractors and trailers. The rail facility would be constructed during the first year of construction activities. The rail facility would be an obvious addition to the currently vacant lot, and would create strong contrasts from new elements of form, line, texture, and color to the flat, horizontal plane of the parcel. The rail facility would be within foreground views of motorists on I-80 and an adjacent county road, and visitors to the nearby truck plaza. Despite the large number of potential viewers of the facility, the overall viewer sensitivity to modification of the site would be low, as the surrounding landscape consists of considerable industrial development.

FAA Lighting

WTGs and other project facilities exceeding 200 feet aboveground level are required to be marked and lighted to meet FAA lighting standards that promote air safety and the efficient use of the navigable airspace. The FAA has the final authority to review and approve lighting plans for wind projects (PCW 2009a). All action alternatives WTGs would result in the following lighting impacts:

- No daytime lighting would be required (depending on WTG color);
- Not all WTGs in the wind farm would need to be lighted at night; however, definition of the periphery of the wind farm is essential;
- The preferred lighting by the FAA for these installations would be the L-864 aviation red-colored flashing lights with a minimum intensity of 2,000 candelas. The flashing lights should all be synchronized simultaneously to clearly define the limits of the periphery. The obstruction light should be top-mounted well above the surface of the nacelle so it can be seen from all directions, including directly in front of the WTG. The flashing red lights have substantially lower intensity values than white strobe or steady lights, and are not an obtrusive source of night lighting (FAA 2005);
- Layout of the obstruction lights along the periphery would have a minimum separation of 0.25 mile and a maximum separation of 0.5 mile between WTGs where feasibly possible;
- Obstruction lights also would be placed on the inside of the group/periphery where there was a significant elevation difference between the nearby/adjacent periphery locations; and
- A minimum of 200 red-colored flashing lights would be required for all action alternatives.

Over 200 simultaneously flashing lights at night over a 347-mile^2 area (Application Area) where no to very few existing night lights occur would result in a significant visual impact. Flashing lights would potentially be seen to the extent of the 30-mile analysis area.

The proposed lighting plan addresses the visual impacts of day and nighttime lighting by minimizing the number of WTGs that would be equipped with FAA compliant lighting. The FAA Advisory Council provides for a lighting plan that requires lighting and marking for the perimeter WTGs and a select group of internal WTGs. The lighting of interior WTGs is generally less important, unless they are taller than the WTGs located on the periphery (FAA 2007). The lighting plan developed for the project (included in Appendix J of the POD) would be updated based on project final design. The FAA would make the final determination regarding the exact number and locations of the towers that would be lighted and the specific lighting design to be used.

Effects to Inventoried Scenic Quality and Sensitivity Level Rating Units

There would be no adverse effects to VRI Class A scenic landscapes from Alternative 1R, as Class A landscapes were not found in the Application Area. Adverse effects would occur to VRI Classes B and C scenic landscapes from Alternative 1R. Adverse effects also would occur to High, Moderate and Low VRI Sensitivity Level landscapes, and wind energy facilities would be visible from the historic Overland Trail, the CDNST, and many recreational use areas shown on **Figure 4.12-1**.

The following scenic quality rating scores described in **Table 3.12-3** would be impacted and reduced: cultural modifications (the degree to which human changes enhance or detract from scenic quality), adjacent scenery (the degree to which scenery outside the SQRU being rated enhances the overall impression of the scenery within the SQRU), and vegetation (the degree of variety from patterns, forms, and textures of vegetation). Subsequent inventories also may reduce the scenic quality rating for adjacent landscapes outside of the Application Area.

The majority of WTGs, including WTGs on slopes greater than 7 percent, and new access roads are located in areas inventoried with a Class B, or moderate, scenic quality as shown in **Table 4.12-7**. Class B lands include the entirety of the Chokecherry site, and the Miller Hill and Sierra Madre portions of the Sierra Madre site. The percent of overhead lines crossing Classes B and C lands are relatively equal.

Each SQRU is rated for the influence of adjacent scenery, or the degree at which scenery outside the SQRU being rated enhances the overall impression of the scenery within the SQRU. The scenic quality of adjacent SQRUs would be impacted by proposed facilities as they would be visible in middleground or background distance zones as viewed from sensitive viewpoints in adjacent SQRUs. Subsequent inventories may reduce the scenic quality rating for adjacent landscapes.

The majority of WTGs, including WTGs on slopes greater than 7 percent, are located in areas inventoried with a Low sensitivity level, likely owing to the fact that south facing aspects of Chokecherry and most of the Sierra Madre site are not visible from populated areas along the I-80 corridor. **Table 4.12-8** provides a summary of the percentage of proposed aboveground facilities that would affect the sensitive rating. The majority of overhead lines cross lands with High sensitivity.

Table 4.12-7 WTG and Other Surface Facility Impacts to VRI Scenic Quality on BLM Lands

Scenic Quality Rating	Alt 1R	Alt 2	Alt 3	Alt 4
	Percent of WTGs[1]			
BLM – Class B	75	71	70	0
BLM – Class C	25	29	30	0
Total	**100**	**100**	**100**	**0**
	Percent of WTGs > 7.5% grade			
BLM – Class B	80	74	76	0
BLM – Class C	20	26	24	0
Total	**100**	**100**	**100**	**0**
	Percent of Roads Crossing Scenic Quality Rating Units			
BLM – Class B	69	60	60	63
Internal resource roads 5-10% grade	21	18	17	22
Internal resource roads > 10% grade	48	42	43	42
BLM – Class C	31	40	40	37
Internal resource roads 5-10% grade	11	11	11	11
Internal resource roads > 10% grade	20	29	29	26
Total	**100**	**100**	**100**	**100**
	Percent of Overhead Lines Crossing Scenic Quality Rating Units			
BLM – Class B	51	46	49	49
BLM – Class C	49	54	51	51
Total	**100**	**100**	**100**	**100**

[1] Percent of WTGs in SQRUs are estimates based on alternative conceptual designs.

Table 4.12-8 WTG and Other Surface Facility Impacts to VRI Sensitivity Levels on BLM Lands

Sensitivity Level Rating	Alt 1R	Alt 2	Alt 3	Alt 4
	Percent of WTGs[1]			
BLM – High Sensitivity Level	23	23	23	0
BLM – Moderate Sensitivity Level	30	27	17	0
BLM – Low Sensitivity Level	48	50	61	0
Total[2]	**100**	**100**	**100**	**0**
	Percent of WTGs > 7.5% grade			
BLM – High Sensitivity Level	24	27	24	0
BLM – Moderate Sensitivity Level	31	26	20	0
BLM – Low Sensitivity Level	45	47	56	0
Total	**100**	**100**	**100**	**0**
	Percent of Roads Crossing Sensitivity Level Rating Units			
BLM – High Sensitivity Level	43	51	52	54
Internal resource roads 5-10% grade	13	15	14	16
Internal resource roads > 10% grade	29	36	37	37
BLM – Moderate Sensitivity Level	42	29	28	26
Internal resource roads 5-10% grade	13	8	7	9
Internal resource roads > 10% grade	29	21	20	17
BLM – Low Sensitivity Level	15	21	21	21
Internal resource roads 5-10% grade	5	6	6	7
Internal resource roads > 10% grade	10	14	14	14
Total[2]	**100**	**100**	**100**	**100**
	Percent of Overhead Lines Crossing Sensitivity Level Rating Units			
BLM – High Sensitivity Level	54	45	41	44
BLM – Moderate Sensitivity Level	7	26	29	25
BLM – Low Sensitivity Level	39	29	30	31
Total	**100**	**100**	**100**	**100**

1 Percent of WTGs in SLRUs are estimates based on alternative conceptual designs.
2 Discrepancies in totals due to rounding.

Table 4.12-9 shows the numbers of acres and the proportion of acres within the Rawlins RMP area that are rated as Class A, B, and C within SQRUs; and as Low, Moderate, and High within SLRUs. The table also summarizes the number of acres for SQRUs and SLRUs and associated ratings within the Application Area; and determines the proportion of these units to the Rawlins RMP area units. Current VRI acres that would be affected by proposed project activities account for at most 2 percent of the Rawlins RMP area.

Table 4.12-9 SLRUs and SQRUs in the RFO Area and Percentage of RFO Area SLRUs and SQRUs in the Application Area

		Acres in Rawlins RFO Area	Percent in Rawlins RFO Area	Acres in Application Area	Percent of Application Area in Rawlins RFO Area
SLRUs	High	2,794,882	28.2	89,228	0.9
	Medium	3,835,919	38.7	79,518	1.1
	Low	3,279,400	33.1	53,234	0.7
SQRUs	A	368,956	3.7	0	0.0
	B	3,531,961	35.6	165,948	1.7
	C	6,031,290	60.7	56,032	0.9

Source: AECOM; Otak, Ink. 2011.

In summary, future VRIs following project construction would likely reduce the scenic quality and/or sensitivity ratings in the analysis area, thereby potentially reducing future VRI classes due to the presence of the project.

Indirect Long-term Effects

Indirect effects from Alternative 1R could occur if adverse changes to the visual quality of the landscape made the area a less desirable location for recreation, resulting in a loss of tourist or other recreation-related revenues to local economies. Direct effects of the proposed project on trail uses, hunting, and other recreational sites in the analysis area are described in Section 4.7, Impacts to Recreation.

4.12.5.2 Compliance with BLM Visual Resource Objectives

BLM VRM classes apply only to BLM-managed land. While facilities constructed on private land may affect the visual quality of public land, BLM has limited authority for VRM compliance on private land.

Alternative 1R (including WTGs, transmission lines, collector lines, other aboveground facilities) would be located on VRM Class IV lands as shown on **Figure 4.12-2**; no facilities with exception to new access roads are anticipated on VRM Classes II and III lands in the Application area.

Short-term

In the short-term, BLM VRM Class IV objectives would be met during construction and installation of WTGs and ancillary operational facilities that include transmission lines, substations, step-up transformers, underground and overhead electric collection and communication lines, roads, IRF, and O&M facility. Vegetation clearing, grading, occupancy, facility construction, nighttime lighting, and revegetation of the project phases would result in areas of disturbed soil surface, human activity, and dust resulting in strong color, line, and texture contrast that would be prominent, especially when viewed from higher elevations such as WY 71 and the CDNST. According to the POD construction schedule, all road construction would occur in Year 1 even though aboveground facilities may not be installed for 1 to 3 years later, thus increasing the duration of visual impacts. As aboveground facilities are installed in phases, short-term changes are likely to be most pronounced in specific development areas within the Application Area.

These short-term effects, together and individually, would represent strong visual changes as seen from historic and scenic trails, recreational use areas, residential areas, and KOPs, and would not repeat the basic elements found in the predominant natural features of the characteristic landscape. When located within 1 mile of the viewer, or when viewed from an elevated position (such as the CDNST), construction activities would attract attention or dominate the view of the casual observer. While these activities and facilities would be a major focus of viewer attention, VRM Class IV would be met as it provides for major modifications of the existing landscape character.

Long-term

The contrast rating system is used by the BLM to analyze potential visual impact of proposed projects and activities. The degree of contrast of Alternative 1R components relative to the existing landscape documents the compatibility of the proposed project with BLM VRM Class IV objectives. **Table 4.12-3** summarizes the contrast ratings of all action alternatives as seen from 21 KOPs, and whether VRM Class IV was achieved for each alternative. The table also summarizes the location of each KOP and the direction of views used to prepare contrast rating forms and visual simulations. **Table 4.12-4** estimates the percent of WTGs in VRM Class IV areas (both public and private lands) based on the conceptual layout of each action alternative.

Contrast ratings found that WTGs combined with all other aboveground facilities, including the transmission line, substations, IRF, and the O&M would result in moderate to strong changes. The angular, vertical forms and straight edges of the WTGs would dominate the horizontal lines of the landscape as seen within the foreground-middle ground distance range. Overhead collector lines would be small in scale relative to the WTGs, but would contribute clutter to the landscape. BLM BMPs and ACMs, such as BLM Gold Book design criteria to harmonize facility colors with the surrounding environment, would reduce form, line, color, and texture changes; however, the size, geographic extent, and multiple facility types would not repeat the elements of form, line, color, and texture of the characteristic landscape.

Although long-term disturbance accounts for 3.3 percent of the Alternative 1R area, the visual impact of Alternative 1R occurs throughout the alternative area as well as the larger visual resource analysis area (viewshed). The level of change would be high because the number, size, and spatial extent of proposed components in the alternative area would be visible from large portions of the visual analysis area, and would dominate the landscape as seen from KOPs and other locations within the alternative area. While some natural to rural landscape characteristic of the Application Area would be partially retained, the majority of the Application Area would have a strong industrial component. In general, where visible outside of the alternative area for approximately 10 miles, Alternative 1 would dominate the view of the casual observer and would result in moderate to high levels of change in the landscape. Alternative 1R would meet the VRM Class IV objectives phase as described in the VRM Plan Amendment preferred alternative in Volume 1, which provides for major modifications of the existing character of the landscape. Still, VRM Class IV objectives require that every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements. With the Design Features, ACMs, BLM BMPs, and BLM-required additional mitigation measures (Section 4.12.9, Mitigation and Mitigation Effectiveness), the visual impact of aboveground facilities would be minimized to the greatest extent practicable.

As described under Effects to Inventoried Scenic Quality and Sensitivity Level Rating Units, future VRIs following project construction would likely reduce the scenic quality and/or sensitivity ratings in the analysis area, thereby potentially reducing future VRI classes due to the presence of the project. Lower VRI classes and the presence of the project also would potentially reduce adjacent VRM Classes II and III objectives in subsequent resource management plan updates.

KOPs

Simulations from viewpoints in the analysis area viewshed have been selected for recreation sites that have historic or scenic importance, and for locations that are representative of views seen from roadways, recreation uses, and residential areas in the visual analysis area. **Table 4.12-3** summarizes the location, direction of view, VRM classes applied to the KOP viewshed, the degree of contrast associated with the implementation of each alternative, and the issues associated with the selection of the KOP.

4.12.6 Impacts to Visual Resources from Alternative 2, Checkerboard Only

Short- and long-term direct and indirect effects to the visual character of the visual analysis area landscape from Alternative 2 would be very similar to the effects that would occur from Alternative 1R. The following discussion summarizes only those impacts that are different from short- and long-term direct and indirect effects disclosed in the discussion for Alternative 1R.

There would be 1,000 WTGs developed under Alternative 2 as in Alternative 1R. WTGs and ancillary facilities would be developed north of T17N in the Sierra Madre Application Area to keep development primarily within the checkerboard land ownership area. To accommodate the displaced WTGs, the development footprint of the proposed 1,000 WTGs has been expanded to the east in the Chokecherry Application Area and to the west in the Sierra Madre Application Area, so that Alternative 2 WTGs occupy a larger development footprint than Alternative 1R. The average distance between individual WTGs and groups of WTGs would increase under Alternative 2, resulting in a decreased density of WTG development relative to Alternative 1R, as depicted on **Figure 4.12-3**.

Short-term Effects

The increased distances between WTGs and WTG groups would require an increase in the total length of linear ancillary facilities, resulting in greater initial disturbance from the construction of increased miles of roads, overhead collection lines, and underground collection lines. Section 2.4.3, Alternative 2, Checkerboard Only, provides the short-term disturbance acres from construction activities for each surface-disturbing activity under Alternative 2.

Construction activities would be spread over a larger area than under Alternative 1R, which would expand the visibility of activities. The expansion of WTGs, internal resource roads, and electric collector lines on Miller Hill would increase the level and areal extent of activities visible from the Overland Trail and the CDNST. There also would be an increase in the level of development viewed from CR 345 and KOP 14. CR 345 provides access to water-based recreation on the North Platte River.

There would be minor differences from Alternative 1R in the scheduling of the transmission line, workforce and equipment scheduling, and the numbers of workers and equipment required for construction activities. The short-term impacts to the visual quality and BLM management of analysis area landscapes are negligible from these differences.

Long-term Effects

The WTGs, associated internal resource roads, and electric collectors under Alternative 2 would expand to cover portions of Bolten, Miller Hill, and Sierra Madre conceptual areas of development not included in the development footprint of Alternative 1R (**Figure 4.12-4**). In the Bolten conceptual area of development, visibility of the project would increase substantially as seen from CR 345 and CR 47S, which provide access to the North Platte River. Visual simulations prepared for each action alternative for KOP 17 depict the greater degree of contrast from Alternative 2 as compared to the Alternative 1R simulation. Other affected viewpoints include the Overland Trail and CDNST, looking towards the Miller Hill area from the trail. **Figure 4.12-3** provides a viewshed analysis that shows the number of WTGs that would be visible under Alternative 2 long-term activities.

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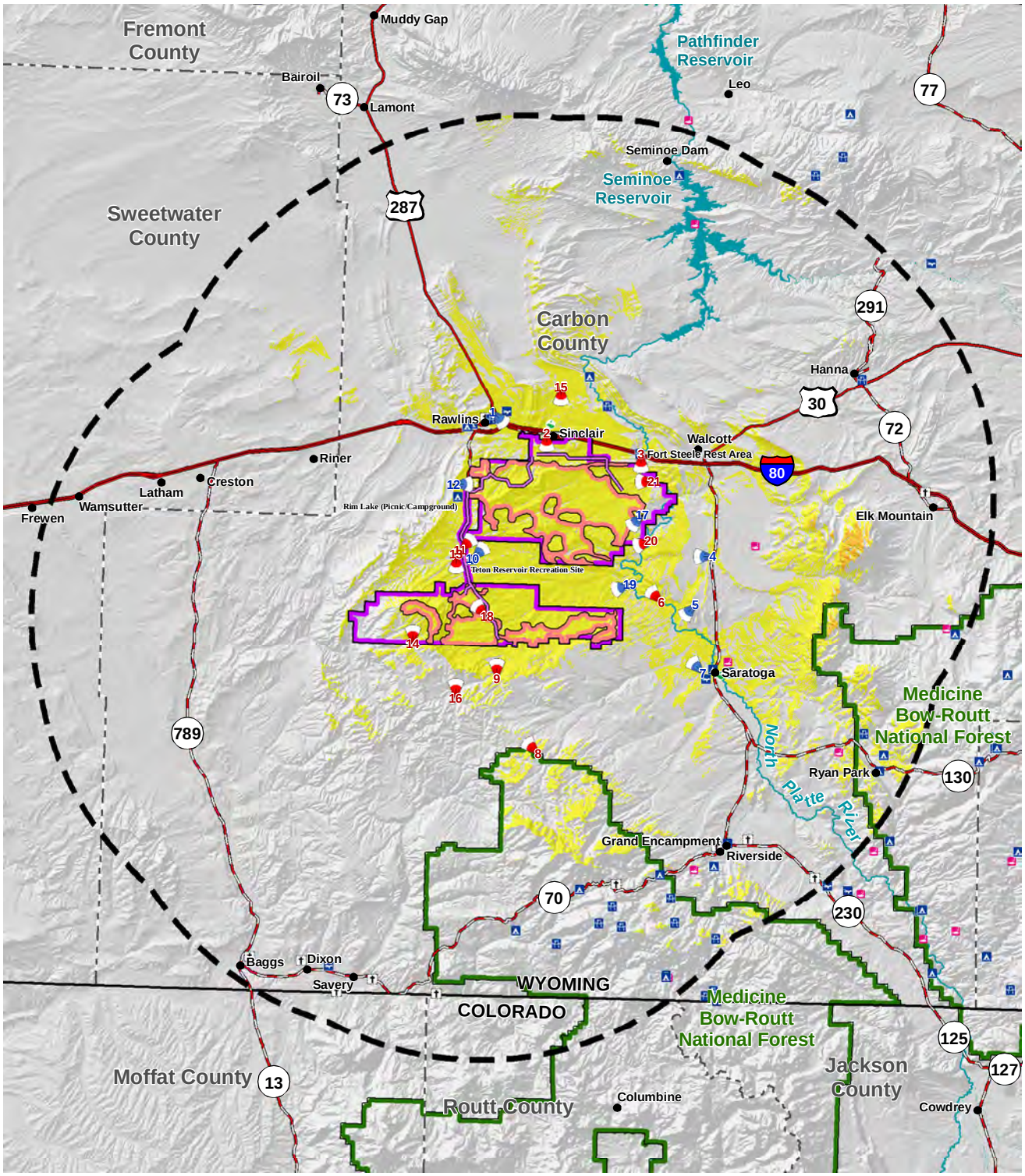

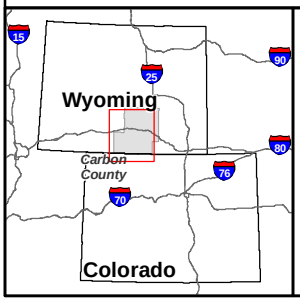

Legend

- Visual Resource Analysis Area
- **Turbine Visibility (100 m Turbine)**
  - 666 - 1000 Turbines
  - 333 - 666 Turbines
  - 1 - 333 Turbines
- Key Observation Point
- Key Observation Point (With Photo Simulation)
- Transmission Line
- Project Area
- Likely Area of Turbine Construction
- Airport
- Cemetery
- Park or Rest Area
- Golf Course
- Fishing
- Campground

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.12-3

WTG Viewshed Analysis Alternative 2

0 5 10 15 20 Miles
0 5 10 15 20 25 Kilometers
1:900,000
N

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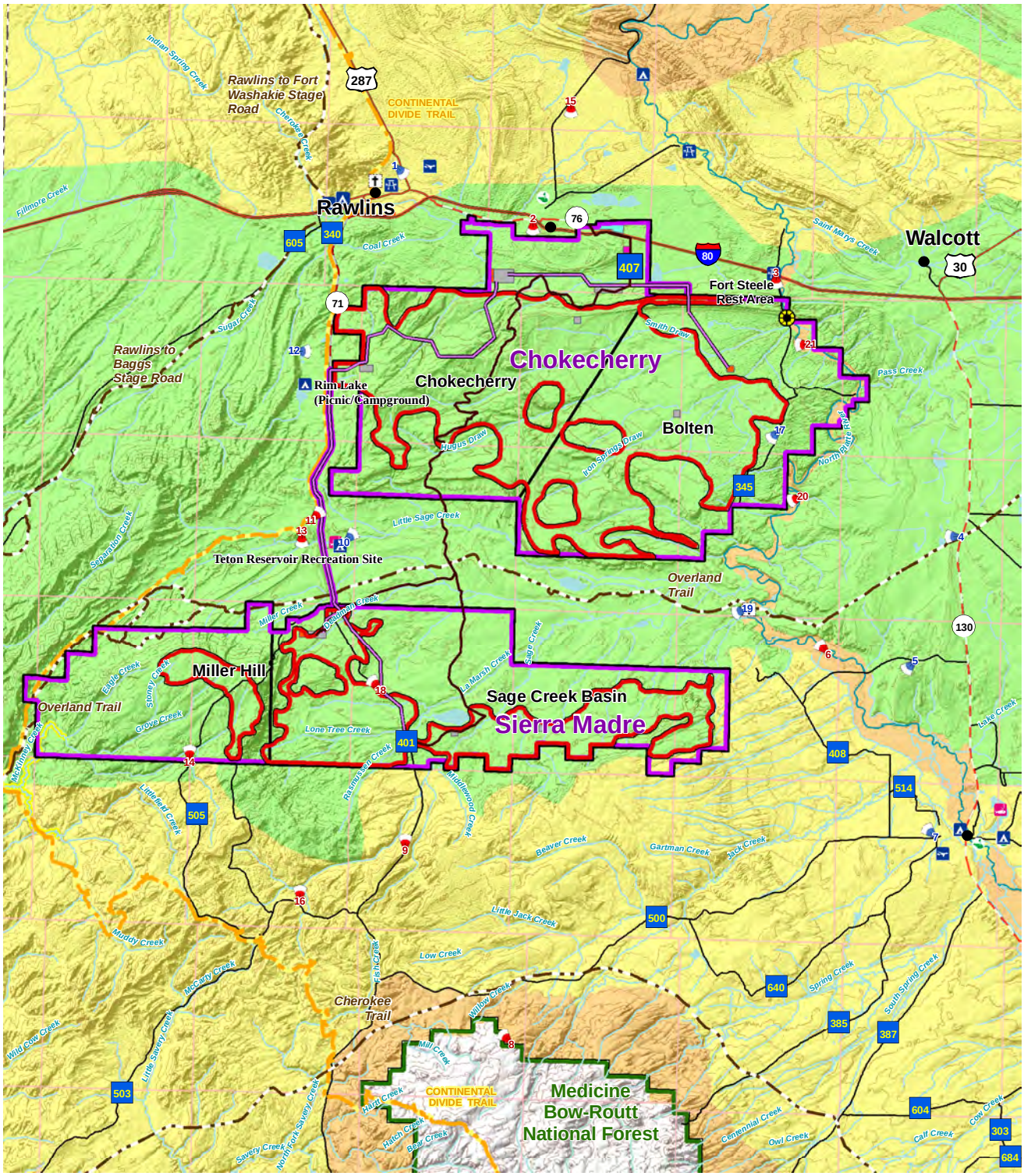

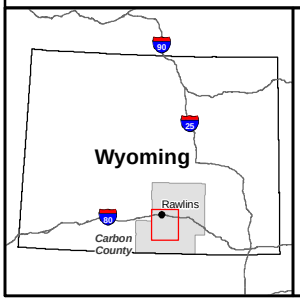

Legend

- Project Area
- Project Subarea

Visual Resource Management

- Class II
- Class III
- Class IV
- Key Observation Point
- Key Observation Point (With Photo Simulation)
- Water Extraction Site
- Transmission Line
- Haul Road
- Alternate O&M Facility
- Intermodal Rail Facility
- Staging Area (Construction Only)
- Substation
- Likely Area of Turbine Construction
- Airport
- Cemetery
- Park or Rest Area
- Golf Course
- Fishing
- Campground
- Continental Divide Trail
- Historic Trail

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.12-4

Visual Resource Management Classes Alternative 2

0 1 2 4 Miles
0 2 4 8 Kilometers
1:350,000
N

There would be an increase in long-term disturbance acres and miles of linear facilities from the operation of the proposed project under Alternative 2 relative to Alternative 1R. A 19 percent increase in long-term disturbance would occur from an increase in the miles of internal resource roads, increase in the operating dimensions of vehicle turnarounds, and increase in the length of the overhead transmission line. The long-term disturbance associated with specific proposed facilities in acres or miles is shown in **Table 2.3-6** for Alternative 2, and **Table 2.3-2** for Alternative 1R. Increased levels of long-term disturbance would be visible in the unimpeded views but would not be noticeable from most KOPS.

The overhead transmission line is located along WY 71 for a substantial portion of the total 37-mile length, extending from a substation in the Sierra Madre Application Area to the Chokecherry substation. There would be a greater visibility of the transmission line to a larger number of people under Alternative 2 relative to Alternative 1R. The transmission line would be a dominant feature along WY 71 and would have a moderate impact to views seen from KOP 12 on the CDNST, creating additional clutter in views from the CDNST in addition to the moderate impact from WTGs. However, most of the transmission line would be within an existing ROW that contains the road, electric distribution lines, and gas pipelines, eliminating the need for a new ROW in undisturbed, predominantly natural landscape.

As seen from WY 71 in the Sierra Madre Application Area, a potential substation would dominate views in the foreground distance zone, blocking a high quality view to the east of the highway, and would be a strong visual impact. Painting the perimeter fence with colors that harmonize with the surrounding vegetation and soils would reduce the impact to motorists on the road.

A substation would be located on private surface in close proximity to the CDNST. A knob would block views of the substation from the trail located directly to the west of the site; however, the substation would be within foreground views of the CDNST to the north and to the southwest and would be a dominant feature in the landscape. Painting the perimeter fence with colors that harmonize with the surrounding vegetation and soils would reduce the impact to viewers on the trail.

Effects to Inventoried Scenic Quality and Sensitivity Level Rating Units

There would be no adverse effects to Class A scenic landscapes from Alternative 2, as Class A landscapes were not inventoried in the Application Area. There would be a slightly lower adverse effect to Class B landscapes under Alternative 2 than from Alternative 1R, and a slightly greater effect to High sensitivity level areas from roads. **Table 4.12-8** provides a summary of the percentage of Alternative 2 aboveground facilities in Classes B and C landscapes. **Table 4.12-7** summarizes the inventoried sensitivity levels of lands affected by Alternative 2 activities.

4.12.7 Compliance with Visual Resource Objectives

Short-term

In the short-term, BLM VRM objectives would not be met during construction and installation of WTGs and ancillary operational facilities. The short-term effects under Alternative 2 would be very similar to the effects described under Alternative 1R, Applicant Proposed Alternative.

Long-term Effects

Alternative 2 long-term effects to BLM VRM objectives are very similar to the effects described under Alternative 1R, as shown on **Figure 4.12-4**. **Table 4.12-3** provides the contrast ratings of all action alternatives as seen from 21 KOPs, and the VRM class achieved for each alternative. There would be a slightly larger contrast from Alternative 2 as seen from KOP 3: I-80 Fort Steele Rest Stop relative to Alternative 1R. While Alternative 2 would result in a strong contrast, it would meet VRM Class IV objectives which provide for major modification of the existing character of the landscape. The VRM Class IV objective requires that every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements. With the

Design Features, ACMs, BLM BMPs, and BLM-required additional mitigation measures (Section 4.12.9, Mitigation and Mitigation Effectiveness), the visual impact of above ground facilities would be minimized to the greatest extent practicable.

4.12.7.1 Impacts to Visual Resources from Alternative 3, No Miller Hill or Sierra Madre

Short- and long-term direct and indirect effects to the visual character of the visual analysis area landscape from Alternative 3 would be very similar to the effects that would occur from Alternative 1R. The following discussion includes only those impacts that are different from short- and long-term direct and indirect effects disclosed in the discussion for Alternative 1R. For impacts that are similar to Alternative 2, refer to the Alternative 2 discussion for descriptions of the impacts.

There would be 1,000 WTGs developed under Alternative 3 as in Alternative 1R. WTGs and ancillary facilities would not be developed on lands below Township Line18N, T18N R89W, and the western half of T18N R88W, which would exclude Miller Hill and the southern portion of the Sierra Madre conceptual area of development. To accommodate the displaced WTGs, the development would be denser in the northern part of the Sierra Madre, Chokecherry, and Bolten conceptual areas relative to Alternative 1R, and the footprint of the proposed 1,000 WTGs would be expanded to the east in the Chokecherry area.

Short-term Effects

The number of WTGs in the northern part of the Sierra Madre, Chokecherry, and Bolten conceptual areas of development would require an increase in the total length of linear ancillary facilities, resulting in greater initial disturbance from the construction of increased miles of roads, overhead collection lines, and underground collection lines. Section 2.4.4, Alternative 3, No Miller Hill or Sierra Madre, provides the short-term disturbance acres from construction activities for each surface disturbing activity under Alternative 3.

Construction activities would be distributed in a different spatial pattern over a larger area than under Alternative 1R, which would expand the visibility of activities in the affected development areas and reduce or eliminate the visibility of activities in the excluded areas. The visibility of construction activities would be greatly reduced as viewed from the CDNST west of Miller Hill, and the residential development south of Miller Hill (KOP 16). The spatial extent of project activities would be reduced as seen from the Overland Trail. The expansion of WTGs, internal resource roads, and electric collector lines into the Bolten conceptual area of development would increase the level and areal extent of activities visible to motorists accessing the North Platte River on CR 345 and CR 347S. There also would be an increase in the level of development viewed from CR 345 and KOP 14. CR 345 provides access to water-based recreation on the North Platte River.

There would be minor differences from Alternative 1R in the scheduling of the transmission line, workforce and equipment scheduling, and the numbers of workers and equipment required for construction activities. The short-term impacts to the visual quality and BLM management of analysis area landscapes are negligible from these differences.

Long-term Effects

The number of WTGs and long-term disturbances of associated internal resource roads and electric collector lines under Alternative 3 would increase in the Chokecherry and the northern portion of the Sierra Madre Application Area, and would be excluded in the Miller Hill and southern portion of the Sierra Madre conceptual areas of development relative to Alternative 1R. Visibility of the project would be reduced as seen from the CDNST and Overland Trail. Visibility of the project would increase substantially in the Bolten conceptual area of development as seen from CR 345 and CR 347S, which provide access to the North Platte River. Visual simulations prepared for each action alternative for KOP 17 depict the greater degree of contrast from Alternative 3 as compared to the Alternative 1R

simulation. **Figure 4.12-5** provides a viewshed analysis that shows the number of WTGs that would be visible under Alternative 3 long-term activities.

There would be an increase in long-term disturbance acres and miles of linear facilities from the operation of the proposed project under Alternative 3 relative to Alternative 1R. A 15 percent increase in long-term disturbance would occur from an increase in the miles of internal resource roads, increase in the operating dimensions of vehicle turnarounds, and increase in the length of the overhead transmission line. The long-term disturbance associated with specific proposed facilities in acres or miles is shown in **Table 2.3-9** for Alternative 3 and **Table 2.3-2** for Alternative 1R. Increased levels of long-term disturbance would be visible in the unimpeded views but would not be noticeable from most KOPS.

The overhead transmission line is located along WY 71 for a substantial portion of the total 34-mile length, extending from a substation in the Sierra Madre Application Area to the Chokecherry substation. The impacts to viewers on the CDNST and WY 71 are very similar for Alternative 3 as described for Alternative 2.

As seen from WY 71 in the Sierra Madre Application Area, a potential substation would dominate views in the foreground distance zone, blocking a high quality view to the east of the highway, and would be a strong visual impact. Painting the perimeter fence with colors that harmonize with the surrounding vegetation and soils would reduce the impact to motorists on the road.

Effects to Inventoried Scenic Quality and Sensitivity Level Rating Units

There would be no adverse effects to Class A scenic landscapes from Alternative 3, as Class A landscapes were not inventoried in the Application Area. There would be a slightly lower adverse effect to Class B and Class C landscapes under Alternative 3 than from Alternative 1R, and a slightly greater effect to High sensitivity level areas from roads. **Table 4.12-8** provides a summary of the percentage of Alternative 3 aboveground facilities in Classes B and C landscapes. **Table 4.12-7** summarizes the inventoried sensitivity levels of lands affected by Alternative 3 activities.

4.12.7.2 Compliance with BLM Visual Resource Objectives

Short-term

In the short term, BLM VRM objectives would not be met during construction and installation of WTGs and ancillary operational facilities. The short-term effects under Alternative 3 would be very similar to the effects described under Alternative 1R.

Long-term

Long-term Alternative 3 effects to BLM VRM objectives are very similar to the effects described under Alternative 1R, as shown on **Figure 4.12-6**. **Table 4.12-3** provides the contrast ratings of all action alternatives as seen from 21 KOPs, and the VRM class achieved for each alternative. As summarized for 21 KOPs in the table, there would be a slightly larger contrast from Alternative 3 relative to Alternative 1R.

Alternative 3 would result in a strong contrast, but would meet VRM Class IV objectives which provide for a major modification of the existing character of the landscape. The VRM Class IV objective requires that every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements. With the Design Features, ACMs, BLM BMPs, and

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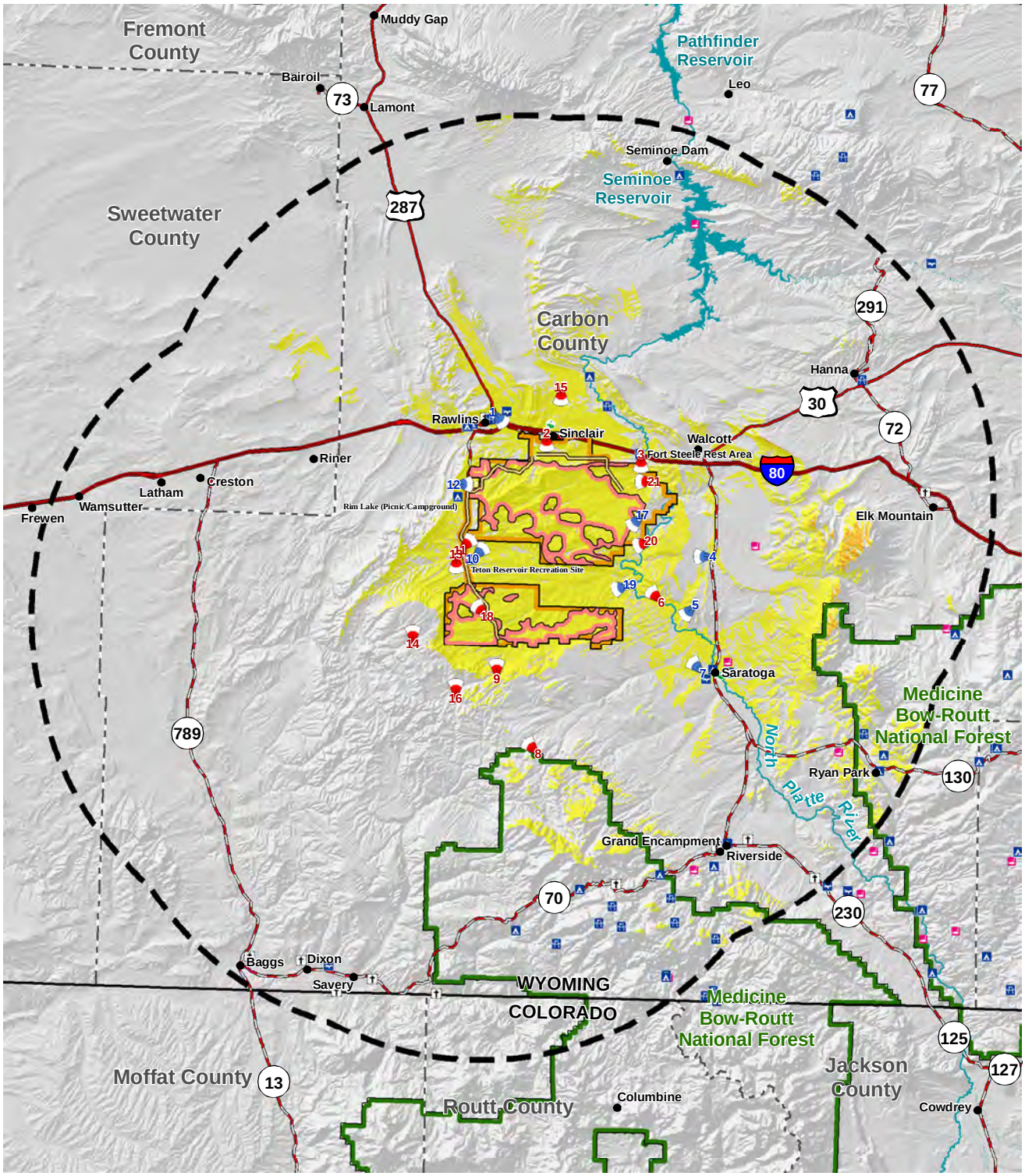

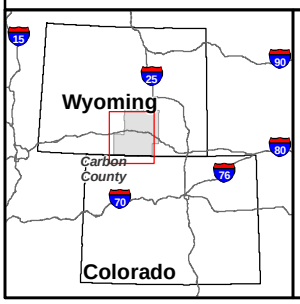

Legend

- Visual Resource Analysis Area
- **Turbine Visibility (100 m Turbine)**
  - 666 - 1000 Turbines
  - 333 - 666 Turbines
  - 1 - 333 Turbines
- Key Observation Point
- Key Observation Point (With Photo Simulation)
- Transmission Line
- Project Area
- Likely Area of Turbine Construction
- Airport
- Cemetery
- Park or Rest Area
- Golf Course
- Fishing
- Campground

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.12-5

WTG Viewshed Analysis Alternative 3

0 5 10 15 20 Miles
0 5 10 15 20 25 Kilometers
1:900,000
N

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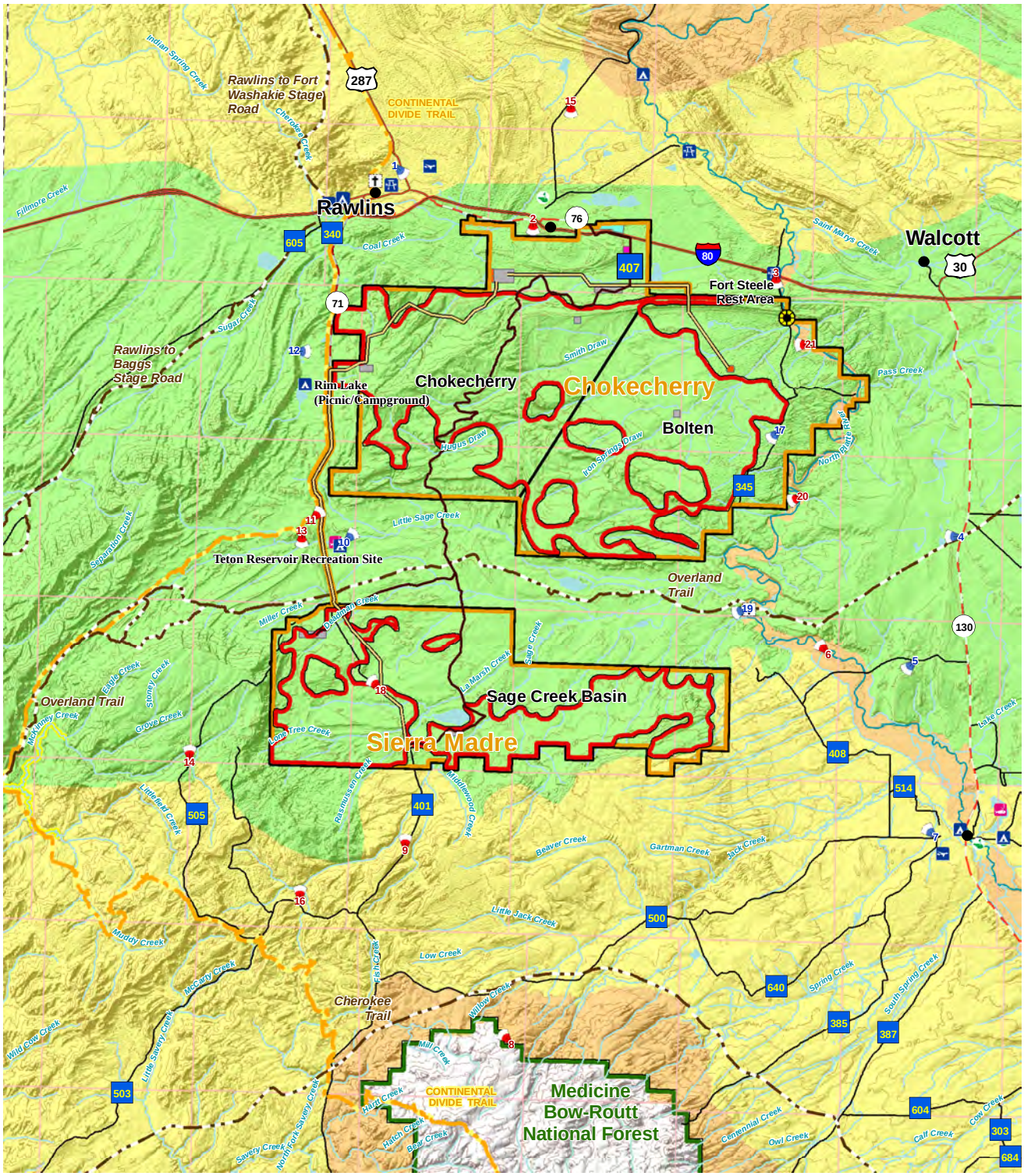

Legend

- Project Area
- Project Subarea

Visual Resource Management

- Class II
- Class III
- Class IV
- Key Observation Point
- Key Observation Point (With Photo Simulation)
- Water Extraction Site
- Transmission Line
- Haul Road
- Alternate O&M Facility
- Intermodal Rail Facility
- Staging Area (Construction Only)
- Substation
- Likely Area of Turbine Construction
- Airport
- Cemetery
- Park or Rest Area
- Golf Course
- Fishing
- Campground
- Continental Divide Trail
- Historic Trail

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Figure 4.12-6

Visual Resource Management Classes Alternative 3

0 1 2 4 Miles
0 2 4 8 Kilometers
1:350,000
N

BLM-required additional mitigation measures (Section 4.12.9, Mitigation and Mitigation Effectiveness), the visual impact of above ground facilities would be minimized to the greatest extent practicable.

4.12.8 Impacts to Visual Resources from Alternative 4, Private Lands Only

Short- and long-term direct and indirect effects to the visual character of the visual analysis area landscape from Alternative 4 would be similar to the effects that would occur from Alternative 1R. The following discussion includes only those impacts that are different from short- and long-term direct and indirect effects disclosed in the discussion for Alternative 1R.

There would be 846 WTGs developed under Alternative 4, a reduction in the number of WTGs relative to Alternatives 1R, 2, and 3. WTGs and ancillary facilities would be developed only on private lands in all development areas. BLM would provide reasonable access to private lands to allow the construction and operation of the proposed project. Linear components that connect WTGs and WTG groups, such as internal resource roads, below and aboveground collector lines, and the overhead transmission line would be located partially on private lands. Because WTGs would be installed only on private surface, the development footprint contains a larger area than under the other action alternatives. The overall footprint of development in the Chokecherry area (north Application Area) is similar but slightly expanded from the development footprints of Alternatives 2 and 3. The western portion of the Sage Creek Basin conceptual area of development would be developed under Alternative 4, as depicted on **Figure 4.12-7**.

Short-term Effects

The increased distances between WTGs and WTG groups in a larger development footprint would require an increase in the total length of linear ancillary facilities, resulting in the largest initial disturbance from the construction of increased miles of roads, overhead collection lines, and underground collection lines of all action alternatives. Section 2.4.5, Alternative 4, Private Lands Only, provides the short-term disturbance acres from construction activities for each surface disturbing activity under Alternative 4.

Construction activities would be spread over a larger area than under Alternative 1R, which would expand the visibility of activities. The expansion of WTGs, internal resource roads, and electric collector lines into the Miller Hill development area would increase the degree of contrast and areal extent of activities visible from the Overland Trail and the CDNST. There also would be an increase in the level of development viewed from CR 345 and KOP 14. CR 345 provides access to water-based recreation on the North Platte River.

There would be minor differences from Alternative 4 in the scheduling of the transmission line, workforce and equipment scheduling, and the numbers of workers and equipment required for construction activities. The short-term impacts to the visual quality and BLM management of analysis area landscapes are negligible from these differences.

Long-term Effects

The WTGs, associated internal resource roads, and electric collector lines under Alternative 4 would expand to cover portions of Bolten, Miller Hill, Sage Creek Basin, and Sierra Madre conceptual areas not included in the development footprint of Alternative 1R. In the Sage Creek Basin conceptual area of development, visibility of the project would increase substantially as seen from CR 345 and CR 47S, which provide recreational access to the North Platte River. Visual simulations prepared for each action alternative for KOP 17 depict the greater degree of contrast from Alternative 4 as compared to the Alternative 1R simulation. Other affected viewpoints include the Overland Trail and CDNST, looking towards Miller Hill from the trail. **Figure 4.12-7** provides a viewshed analysis that shows the number of WTGs that would be visible under Alternative 4 long-term activities.

There would be an increase in long-term disturbance acres and miles of linear facilities from the operation of the proposed project under Alternative 4 relative to Alternative 1R. A 24 percent increase in

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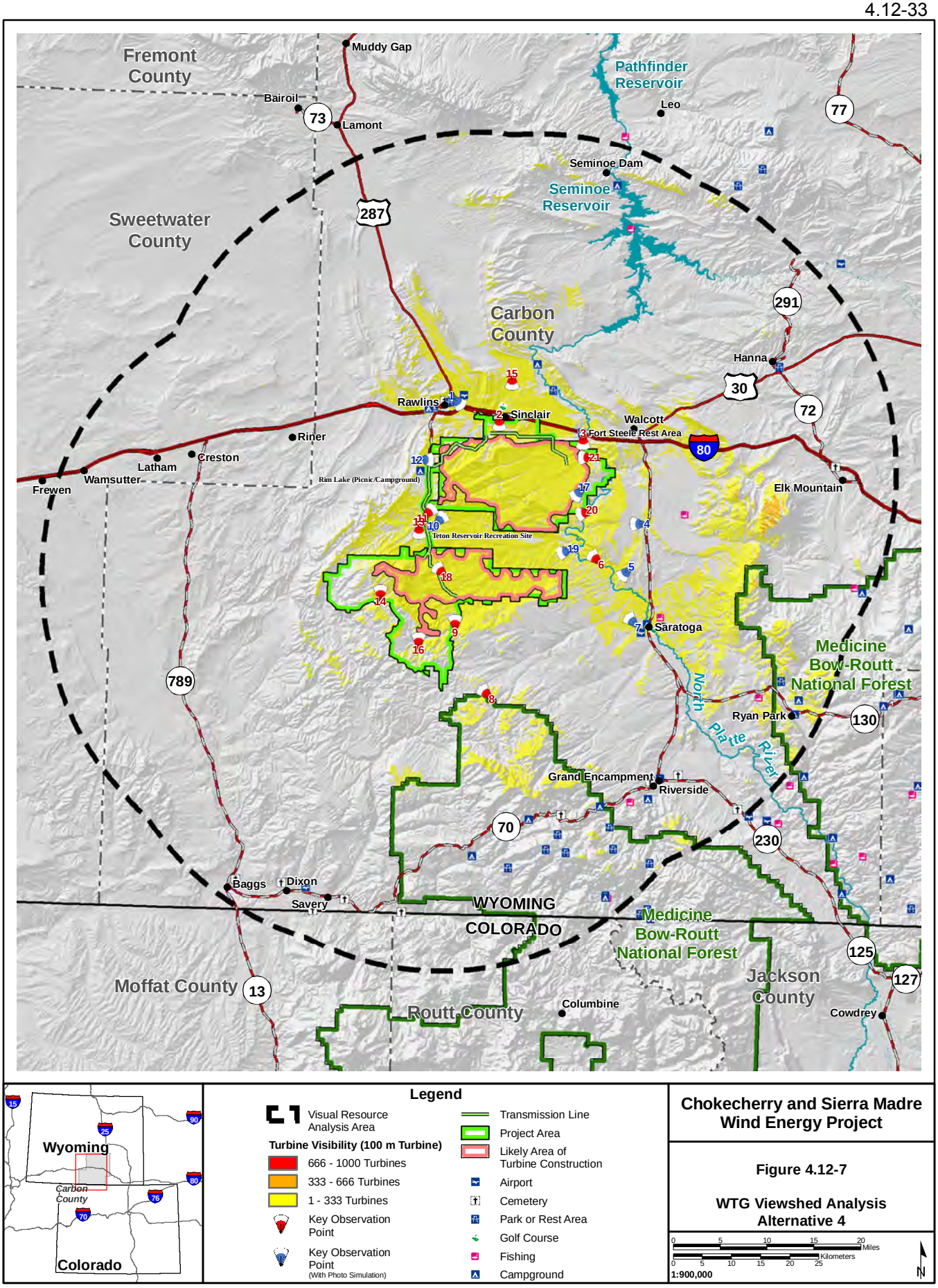

Legend

- Visual Resource Analysis Area
- **Turbine Visibility (100 m Turbine)**
  - 666 - 1000 Turbines
  - 333 - 666 Turbines
  - 1 - 333 Turbines
- Key Observation Point
- Key Observation Point (With Photo Simulation)
- Transmission Line
- Project Area
- Likely Area of Turbine Construction
- Airport
- Cemetery
- Park or Rest Area
- Golf Course
- Fishing
- Campground

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.12-7

WTG Viewshed Analysis Alternative 4

0 5 10 15 20 Miles
0 5 10 15 20 25 Kilometers
1:900,000
N

long-term disturbance would occur from an increase in the miles of internal resource roads, increase in the operating dimensions of vehicle turnarounds, and increase in the length of the overhead transmission line. The long-term disturbance associated with specific proposed facilities in acres or miles is shown in **Table 2.3-12** for Alternative 4, and **Table 2.3-2** for Alternative 1R. Increased levels of long-term disturbance would be visible in the unimpeded views but would not be noticeable from most KOPS.

The overhead transmission line is located along WY 71 for a substantial portion of the total 36-mile length, extending from a substation in the Sierra Madre Application Area to the Chokecherry substation. There would be a greater visibility of the transmission line to a larger number of people under Alternative 4 relative to Alternative 1R. The transmission line would be a dominant feature along WY 71 and would have a moderate impact to views seen from KOP 12 on the CDNST, creating additional clutter in views from the CDNST in addition to the moderate impact from WTGs. However, most of the transmission line would be within an existing ROW that contains the road, electric distribution lines, and gas pipelines, eliminating the need for new ROW in undisturbed, predominantly natural landscape.

As seen from WY 71 in the Sierra Madre Application Area, a potential substation would dominate views in the foreground distance zone, blocking a high quality view to the east of the highway, and would be a strong visual impact. Painting the perimeter fence with colors that harmonize with the surrounding vegetation and soils would reduce the impact to motorists on the road.

A substation would be located on private land in close proximity to the CDNST. A knob would block views of the substation from the trail located directly to the west of the site; however, the substation would be within foreground views of the CDNST to the north and southwest, and would be a dominant feature in the landscape. Painting the perimeter fence with colors that harmonize with the surrounding vegetation and soils would reduce the impact to viewers on the trail.

Effects to Inventoried Scenic Quality and Sensitivity Level Rating Units

No WTGs are proposed for public lands under Alternative 4; therefore, no BLM lands inventoried within SQRUs or sensitivity level rating units would be affected by proposed WTGs. Adverse effects would occur to Classes B and C landscapes from internal resource roads and overhead lines. There would be less adverse effects to Classes B and C landscapes and to High, Moderate, and Low sensitivity level areas under Alternative 4 than from Alternative 1R, because a small proportion of all proposed surface facilities under Alternative 4 are located on public lands. **Table 4.12-8** provides a summary of the percentage of Alternative 4 aboveground facilities in Classes B and C landscapes. **Table 4.12-7** summarizes the inventoried sensitivity levels of lands affected by Alternative 4 project activities.

4.12.8.1 Compliance with BLM Visual Resource Objectives

Short-term

The short-term effects impacts to visual resources under Alternative 4 would be very similar to the effects described under Alternative 1R. However, the effects would occur primarily from the construction of WTGs on private lands, which are not managed with VRM objectives. In the short-term, BLM VRM objectives would be met during construction and installation of ancillary facilities that would be required for WTGs located on private lands.

Long-term

BLM lands would be directly impacted by overhead transmission lines, collector lines, and a road network, and indirectly by views of WTGs and other facilities located on private land. Alternative 4 effects to BLM VRM objectives are similar to the effects described under Alternative 1R, as shown on **Figure 4.12-8**. **Table 4.12-3** provides the contrast ratings of all action alternatives as seen from 21 KOPs, and the VRM class achieved for each alternative. With the Design Features, ACMs,

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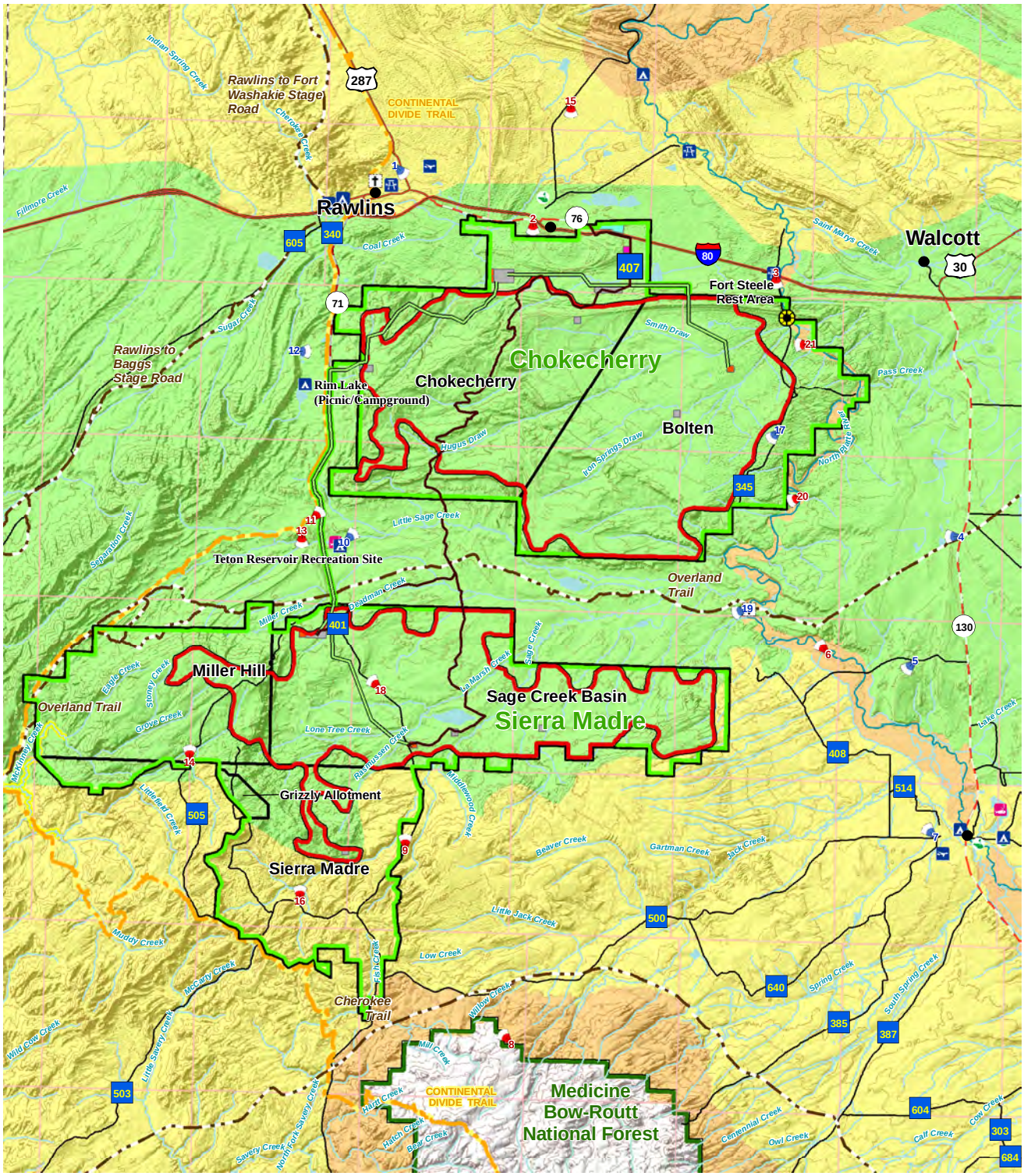

Legend

- Project Area
- Project Subarea

Visual Resource Management

- Class II
- Class III
- Class IV
- Key Observation Point
- Key Observation Point (With Photo Simulation)
- Water Extraction Site
- Transmission Line
- Haul Road
- Alternate O&M Facility
- Intermodal Rail Facility
- Staging Area (Construction Only)
- Substation
- Likely Area of Turbine Construction
- Airport
- Cemetery
- Park or Rest Area
- Golf Course
- Fishing
- Campground
- Continental Divide Trail
- Historic Trail

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.12-8

Visual Resource Management Classes Alternative 4

0 1 2 4 Miles
0 2 4 8 Kilometers
1:350,000
N

BLM BMPs, and BLM-required additional mitigation measures, the visual impact of Alternative 4 would be minimized to the greatest extent practicable.

4.12.9 Mitigation and Mitigation Effectiveness

Mitigation measures are meant to minimize adverse contrasts of project components with the existing landscape. The measures should be applied to all proposed components, even those that meet VRM objectives. In addition, mitigation measures should be applied to proposed activities on private lands. Mitigation would enable proposed project activities on both public and private land to harmonize with the surrounding landscape to the extent feasible. Mitigation measures do not include ACMs or BLM standard mitigation, which are incorporated into the proposed project. In general, resource protection measures proposed for erosion control, road construction, rehabilitation and revegetation, and wildlife protection also would mitigate effects to visual quality.

GEN-1: Phased Construction Sequence Mitigation (Chapter 2.0 and **Appendix A,** Section A.1.3.1) would change all action alternatives by limiting surface disturbance to areas where WTGs would be constructed within 12 months with a goal to mitigate impacts to visual, wildlife, soils, water, and vegetation resources from surface disturbance.

Effectiveness: Impacts to some sensitive viewpoints within the Application Area from construction activities would be substantially reduced with implementation of phased construction sequence mitigation. Under GEN-1, activities would be limited to specific locations within the overall construction schedule. Effects to viewers at specific viewpoints would likely occur for a maximum of 1 year, as activities during the construction phase would be limited to specific locations within the Application Area. Specific areas would be reclaimed sooner down to the long-term (operational) disturbance areas, reducing the overall area of visible disturbance.

GEN-1 would reduce the duration of short-term visual conflicts by compressing the time between construction and reclamation, and increasing the effectiveness of reclamation following completion of construction activities. As the reclamation of one area occurs concurrently with construction in another area, it would be possible to reduce the overall area of visible disturbance and the amount of time that exposed soils and erosion create color and textural contrasts with the surrounding vegetation.

VR-1: Transmission structures and overhead collector line structures would be treated to have a muted, darker color than conventional galvanized steel to reduce color contrasts. The recommended paint color for transmission structures is Shadow Gray from the BLM Standard Environmental Colors Chart CC-00. Steel pole equivalents used in the installation of the overhead electric collector lines should be finished with paint or a self-weathering finish that will harmonize with colors of the surrounding landscape (i.e., approximate the color of wood when used with wood overhead collector lines). When not used with wood poles, the recommended paint color for powerline structures is Shadow Gray from the BLM Standard Environmental Colors Chart CC-00.

VR-2: Place vegetative debris on cut-and-fill slopes to vary texture and color of cut-and-fills until vegetation has been re-established.

VR-3: No manufacturer logos or brand names would be displayed on the WTG.

VR-4: Lighting for ancillary facilities would be motion-activated and shielded downward to limit night lighting impacts beyond the site.

VR-5: Use non-reflective 30 percent gray on WTGs, which would be less obtrusive from most distances and viewing angles, and would still be light enough to blend with the sky.

VR-6: Utilize an Audio Visual Warning System (AVWS) aircraft detection and warning system to reduce day and night lighting requirements for WTGs. An AVWS is a radar-based obstacle avoidance system that uses obstruction lighting and audio signals to alert aircraft of potential collisions with WTGs. AVWS allows wind farm lights to remain off unless the system detects aircraft with a potential heading for collision. The FAA has approved AVWS to be installed, tested, and approved for use in the national airspace. The FAA is currently updating the FAA Advisory Circular 70/7460-1K - Obstruction Marking and Lighting to incorporate AVWS. Implementation of AVWS would substantially reduce the visual impact from FAA lighting of WTGs (OCAS, Inc. 2010).

VR-7: The most effective color for substation components, and fencing would be Shadow Gray from the BLM Standard Environmental Colors Chart CC-00 or a similar color in a dark gray color range.

Effectiveness: Mitigation measures VR-1, 2, and 3 would be moderately effective in reducing visual contrasts. Mitigation measure VR-5 would be highly effective in reducing visual contrasts, especially in the background distance zone and beyond where white colors would otherwise increase color contrasts for great distances. Implementing VR-4 would reduce off-site lighting from ancillary facilities, and VR-6 would eliminate day and night lighting contrasts from WTGs except in rare occasions when the system detects aircraft with a potential heading for collision.

4.12.10 Residual Impacts

Mitigation measures would reduce all adverse contrasts that can be reduced. However, residual impacts would continue but to a lesser degree with application of visual resource mitigation measures. The number and magnitude of roads and facilities, and the scale and movement of WTGs would continue to attract and/or dominate the attention of viewers in nearby communities, roads and highways, and sensitive viewpoints such as the North Platte River and the Overland Trail. Impacts from aboveground facilities would occur throughout the operational life of the project. Impacts after decommissioning would continue from surface disturbance until self-sustaining stands of vegetation are reestablished and visually adapted to the undisturbed surrounding vegetation (approximately 50 to 100 years following reclamation).

4.12.11 Irreversible and Irretrievable Commitment of Resources

Irreversible commitments are permanent or essentially permanent resource uses or losses; they cannot be reversed, except in the extreme long term. An irretrievable commitment of a resource is one in which the resource or its use is lost for a period of time. Until the affected areas are reclaimed following decommissioning of the project, the reduction in visual quality immediately following installation of the proposed project under all action alternatives would be an irretrievable loss. Future VRIs following project construction would likely reduce scenic quality and sensitivity level ratings throughout the life of the project. However, upon completion of the project, the WTGs, facilities, and roads would be removed and the disturbed areas associated with the project reclaimed, therefore no irreversible commitment of visual resources is anticipated.

4.12.12 Relationship between Local Short-term Uses and Long-term Productivity

The relationship between local short-term uses and long-term productivity does not apply to visual resources; however, the effects to visual resources in the visual resource analysis area do affect short-term uses and long-term productivity for recreation uses.

4.13 Impacts to Water Resources

Potential impacts to water resources were identified through federal and state agency consultation and public scoping. These include potential impacts to surface water quality and quantity such as increased erosion and sediment loads or turbidity, increased ion or salt concentrations, stream channel instability, and increased consumptive use of water. Also considered are potential impacts to groundwater quality and quantity such as not maintaining beneficial use classifications and decreases to the water table.

Impacts might occur during the construction phase of the project by ground disturbance for roadway, power line, and WTG construction and when water is used for concrete batching and dust abatement. Impacts would continue into the operational phase at more localized locations where long-term disturbance occurs or where roads are constructed or widened at stream crossings, ephemeral drainage ways, or in close proximity to streams. Impacts of the decommissioning phase would be similar to those anticipated during construction.

The Analysis Area used for assessing potential impacts to water resources is defined as all 6th order, 12-digit HUC-12 sub-watersheds (Berelson et al. 2001) that have a portion of the Application Area included within their boundary (**Table 3.13-1** and **Figure 3.13-1**). A total of 21 sub-watersheds were assessed in this analysis. The total area encompassed by these sub-watersheds is approximately 640,000 acres, or 1,000 miles^2.

Management considerations in the BLM RFO RMP (BLM 2008a) are derived in part from the CWA, the ESA, and Wyoming state statutes (**Table 4.13-1**). The CWA requires that surface water quality be protected. Project components that disturb greater than 1/10 acre of streams or other Waters of the U.S. will require a CWA Section 404 Permit be filed and approved by the USACE that includes detailed, site-specific BMPs and ACMs. The ESA is the basis for limited development of most consumptive water uses for the protection of endangered species downstream of the project. Wyoming statutes address point source and non-point source pollution (W.S. 35), water quality standards (W.S. 35), and water use (W.S. 41). The BLM RFO RMP addresses surface-disturbing activities through consideration of each of the above references.

Table 4.13-1 Relevant Management Considerations for Water Resources

BLM RMP and ROD – Water Resources
Management Objectives • Maintain or improve surface and groundwater quantity and quality consistent with applicable state and federal standards and regulations. • Control or remediate sources and causes of pollution on public lands in cooperation with other federal, local, and state agencies and private entities. • Maintain or reestablish proper watershed, wetland, aquifer, riparian, and stream functions to support natural or desired surface flow regimes that meet state water quality standards. • Minimize or control contributions of non-point source pollution from public lands to all receiving waters. • Minimize or control elevated levels of salt contribution from public lands to the Colorado River system consistent with WDEQ water quality regulations. • Provide for availability of water to support uses authorized on public lands where appropriate.

Table 4.13-1 Relevant Management Considerations for Water Resources

Management Goals • Maintain or improve water quality by managing surface land use and groundwater resources, where practical and within the scope of the BLM's authority, according to the State of Wyoming Water Quality Rules and Regulations. • Maintain the hydrologic and water quality conditions needed to support riparian/wetland areas; minimize flood and sediment damage to water resources from human and natural causes; analyze and, where possible, minimize levels of salt loading in watersheds; and protect water resources used by the public (including impoundments, reservoirs, pipelines, and irrigation ditches) and by federal, state, and local agencies for fisheries, wildlife, livestock, agricultural, recreational, municipal, and industrial uses. • All accidental spills of environmental pollutants on public lands will be addressed according to the BLMs Rawlins RMP, Appendix 32. • Implement intensive management of surface disturbing activities in watersheds contributing to waterbodies listed on the Wyoming 303(d) list of waterbodies with water quality impairments or threats, within the BLM's authority. • Maintain or improve wetland/riparian areas as required by the Wyoming Standards for Healthy Rangelands (BLM 1997b). • Activities that would cause water depletion within the Colorado River system or North Platte River system would comply with existing agreements, decrees, rules, and regulations.
Management Actions • Intensive management of surface disturbing activities would be implemented in watersheds contributing to waterbodies listed on the state's 303(d) list of impaired waterbodies in consultation and cooperation with affected interests. • Manage water and soil resources to meet the Wyoming Standards for Healthy Rangelands. • Surface disturbing activities would be avoided on unstable areas, such as landslides, slopes of greater than 25 percent, slumps, and areas exhibiting soil creep. Reclamation practices and BMPs would be applied as appropriate for surface disturbing activities. • Surface disturbing activities would be avoided in the following areas: 1) identified 100-year floodplains; 2) areas within 500 feet of perennial waters, springs, and wetland and riparian areas; and 3) areas within 100 feet of the inner gorge of ephemeral channels. Exceptions to this would be granted by the BLM based on an environmental analysis and site-specific engineering and mitigation plans. Only those actions within areas that cannot be avoided and that provide protection for the resource identified would be approved.

Source: Proposed RMP, Final EIS for the RFO, Chapter 2, Table 2-1, pp 2-98 through 2-100 (BLM 2008b).

The analysis of surface water quality impacts is based on the assumption that surface disturbance within a given watershed serves as an indicator of the potential for increased sediment and salt runoff. Marston and Dolan (1988) conducted research to investigate the major criteria that control upland erosion in an environment similar to the Application Area. This research showed that slope and vegetative cover exert the most influence on upland erosion rates. Erosion was found to be inversely correlated with vegetation density (i.e., as vegetation density decreases, upland erosion increases). The surface disturbance associated with the proposed project would initially remove vegetative cover, which will increase erosion. Once reclamation is undertaken, the vegetative cover would be reestablished,

decreasing erosion. As the vegetative cover approaches desired density levels, the erosion rate also would approach pre-construction levels. This is expected to occur within 5 to 10 years of initiating reclamation (see Section 4.11.6 and POD, Appendix E).

However, drainages in this area have naturally high sediment yields (SERCD 2005), and during large run-off events, these streams are not sediment-limited, but rather limited by the stream power needed to transport the sediment downstream. A previous study of the Sage Creek watershed indicates that monitoring near the mouth of the watershed may not reflect changes to sediment loads and that monitoring over relatively short periods (less than 10 years) will not be sufficient to factor out non-project impacts such as climate variation, geology, and historical sediment storage (SERCD 2005). Although the Sage Creek stream channel is in a stable form, highly erosive uplands in the watershed contribute the majority of sediment to the stream through hill slope erosion processes during runoff events (SERCD 2005). The higher-altitude upland areas are where project development will generally be concentrated.

GIS analyses were performed to quantify the amount of potential disturbance based on the footprint of each alternative. Further qualitative impact discussion is provided for areas where project components or disturbance are in close proximity to stream channels. Impacts to water quantity are analyzed by comparing the water use for each alterative with the average streamflow rates and volume of the North Platte River.

Impacts from each alterative would be considered significant under any one of the conditions listed below:

- Water quality in surface water is degraded beyond the standards set for the designated use of the receiving waterbody, or other violations of federal or state water quality standards, or negative impacts are experienced to a waterbody listed on the Wyoming 303(d) list of Impaired or Threatened Waterbodies.
- Unmitigated loss of wetlands or wetland function (E.O. 11990 and E.O. 11988) or activities that would degrade wetland/riparian areas such that, as a minimum physical state, PFC Standards for Healthy Rangelands (BLM 2009b) are not maintained.
- Streamflow and stream channel geometry or gradient of perennial, intermittent, and ephemeral streams is altered through accelerated runoff and erosion (e.g., undesirable aggradation, degradation, or side cutting) beyond the expected range of natural processes.
- Streamflow quantity of perennial streams are altered such that established uses by the public and by federal, state, and local agencies for fisheries and wildlife and for livestock, recreational, municipal, and industrial uses cannot be maintained.
- Groundwater quality in any aquifer is degraded such that it can no longer be classified for its current and potential use(s).
- The natural flow or level of groundwater to existing local springs, seeps, flowing artesian wells, or permitted water supply wells is interrupted or reduced to the point beneficial uses cannot be maintained.

For the purposes of analyzing the number of stream crossings, it is assumed that the NHD accurately defines the location of waterways, and that construction and operation of the electrical collection and transmission lines will not increase disturbance because they fall within the road disturbance at streams and riparian areas. It also is assumed that the policies and procedures in place for the ESA (USFWS) and W.S. 41 (WSEO) will adequately address and mitigate any impacts associated with the consumptive use of water during construction and operation of all alternatives.

Because of the programmatic nature of this NEPA analysis, conceptual Project layouts were assumed to reasonably reflect the actual layouts for project construction. Although conceptual layouts were used for overall Project impact assessment, no site specific analyses have been performed. Site specific design, impact analysis, and impact mitigation would occur through subsequent NEPA review by the BLM.

4.13.1 Impacts to Water Resources from the No Action Alternative

Current management in the Analysis Area would be maintained under the No Action alternative. Under this alternative, there would be no project construction or operation and maintenance disturbance to impact water quality or water use. There would be no project construction or operation and maintenance equipment or infrastructure in the area to cause potential hazardous material spills.

Water quality in the area is trending towards improvement due to watershed improvement projects with funding through Section 319 of the CWA (see Section 3.13.2.1). Livestock grazing is the major activity that impacts water quality through decreased vegetative cover and increased channel instability from animal activity. The cooperators of the watershed improvement projects have implemented BMPs that have shown and documented long-term (greater than 10 years) improvements from past conditions.

New water use in the North Platte Basin, both surface and tributary groundwater, is largely limited due to stipulations of the Nebraska v. Wyoming Modified North Platte Decree and the Platte River Cooperative Agreement (U.S. Supreme Court 2001) (see Section 3.13.3). The only new uses potentially allowed are stock, domestic, and municipal uses. These uses must undergo the approval process of the WSEO, which includes consideration of the above decree and agreement as well as consultation with the USFWS under Section 7 of the ESA. Through these processes, all existing water users and interstate agreements are protected.

4.13.2 Impacts to Water Resources from Alternative 1R, Applicant Proposed Alternative

Impacts would occur during the construction, operation, and decommissioning phases of Alternative 1R. During construction, potential impacts include increased runoff and erosion from disturbed lands due to construction of this alternative, increased stream channel instability from construction of road crossings, and potential degradation of surface and groundwater quality due to spills of hazardous materials from construction equipment. During operation and maintenance, potential impacts would include increased runoff and erosion from disturbed lands, increased stream channel instability related to new stream crossings, and potential spills of hazardous materials. Impacts during decommissioning would be similar to those caused during construction.

Surface disturbance within each sub-watershed during construction and operation of Alternative 1R is detailed in **Table 4.13-2** and depicted in **Figure 4.13-1**. Sub-watershed disturbance ranges from less than 0.1 percent to 6.4 percent during construction and from less than 0.1 percent to 1.1 percent disturbance during operation. All disturbance associated with streams or wetlands greater than 1/10 acre will require a CWA § 404 Permit be filed and approved by the USACE.

Disturbance associated with this alternative is generally concentrated towards the higher elevations within each sub-watershed. The sub-watershed with the highest percentage of construction disturbance is 101800021304 (Sugar Creek) with 6.4 percent disturbance. This high value is due to the relatively small size of this sub-watershed coupled with the presence of one approximately 240 acre staging area and two approximately 40 acre substation sites along with multiple WTG sites and access roads. Sub-watersheds with construction disturbance equal to or greater than 1 percent include 101800021304 (Sugar Creek), Hugus Draw, Grenville Dome, Rasmussen Creek, Miller Creek, Iron Springs Draw, Lower Sage Creek-Upper North Platte River, McKinney Creek, Middle Sugar Creek, and Upper Sage Creek-North Platte River.

Table 4.13-2 Surface Disturbance of Sub-watersheds Associated with Alternative 1R

Sub-watershed Name	Sub-watershed Total Area (acres)	Alternative 1R Construction Disturbance		Alternative 1R Operation Disturbance		Stream Crossings in sub-watershed (number)
		(acres)	(percent sub-watershed)	(acres)	(percent sub-watershed)	
North Platte Basin						
North Platte River-First Cottonwood Draw	46,942	280	0.6	55	0.2	17
Little Jack Creek	35,771	-	0.0	-	0.0	0
Upper Sage Creek-North Platte River[1]	40,935	446	1.1	90	0.2	29
Rasmussen Creek[1]	23,488	876	3.7	173	0.5	70
Lower Sage Creek-Upper North Platte River[1]	20,079	365	1.8	69	0.3	34
Miller Creek[1]	28,571	746	2.6	134	0.4	43
Upper Little Sage Creek[1]	30,732	-	0.0	-	0.0	0
Lower Little Sage Creek[1]	16,898	151	0.9	31	0.2	8
North Platte River-Coal Mine Draw	34,326	210	0.6	41	0.1	7
North Platte River-Lost Springs Draw	47,020	1	<0.1	1	<0.1	0
Iron Springs Draw	18,853	372	2.0	72	0.4	16
Hugus Draw	35,341	1,500	4.2	308	0.9	86
Grenville Dome	22,059	865	3.9	249	1.1	47
Pass Creek-Stage Station Springs	34,785	-	0.0	-	0.0	0
Middle Sugar Creek	24,897	267	1.1	37	0.1	5
Lower Sugar Creek	42,909	110	0.3	108	0.3	0
101800021304 (Sugar Creek)[2]	11,042	705	6.4	121	1.1	16
North Platte Basin Subtotals	**514,648**	**6,894**	**1.3**	**1,488**	**0.3%**	**378**
White-Yampa Basin						
North Fork Savery Creek	30,812	-	0.0	-	0.0	0
Little Savery Creek	30,995	-	0.0	-	0.0	0

Table 4.13-2 Surface Disturbance of Sub-watersheds Associated with Alternative 1R

Sub-watershed Name	Sub-watershed Total Area (acres)	Alternative 1R Construction Disturbance		Alternative 1R Operation Disturbance		Stream Crossings in sub-watershed (number)
		(acres)	(percent sub-watershed)	(acres)	(percent sub-watershed)	
Muddy Creek-Littlefield Creek[3]	32,259	-	0.0	-	0.0	0
McKinney Creek[3]	30,433	418	1.4	81	0.3	8
White-Yampa Basin Subtotals	**124,499**	**418**	**0.3**	**81**	**0.1%**	**8**
Grand Totals [4]	**639,147**	**7,312**	**1.1**	**1,569**	**0.2**	**386**

[1] Sub-watersheds included in Sage Creek watershed improvement project.

[2] Some 12-digit sub-watersheds (HUs) were assigned the HUC-12 number when no GNIS name was identified on the DRGs. The name in parentheses indicates the HUC-10 name.

[3] Sub-watersheds included in Upper Muddy Creek watershed improvement project.

[4] Discrepancies in total acreage due to rounding.

Note: GIS estimates use assumed component locations to generate disturbance associated with soil limitations. While these estimates may vary somewhat from disturbance estimates that were generated by assuming an average amount of disturbance associated with each project component proposed by alternative (as presented in Chapter 2.0), the difference is estimated to be less than 5 percent.

Under this alternative, 386 road-stream crossings would be constructed. There are a total of 382 locations where roads cross ephemeral streams and four where a perennial stream (Sage Creek) is crossed under the conceptual development of this alternative. All power collector lines would be buried within the road ROW and disturbed area; therefore, no additional disturbance is considered for the collector lines. The number of stream crossings may change during the detailed design phase. These crossings could alter the channel geometry and riparian vegetation, potentially increasing water velocities and decreasing bank stability through all phases of the project. The Application Area experiences high levels of variability in channel processes under natural and existing conditions that may be exacerbated by development. This is due to the combination of the arid climate, high run-off during storm events, and erodible soil types. The majority of these channels are dry (ephemeral/intermittent) for all but the most intense precipitation periods.

Localized channel impacts might occur during high flows and in response to changes in channel geometry from crossing construction and increased erosion due to upland/riparian vegetation clearing. Impacts might include head-cutting, bank failure, channel sedimentation, and channel scour. Construction disturbance near or across drainage channels and streams would likely exacerbate these processes, especially in areas with highly erodible soil types (see Sections 3.9 and 4.9) by decreasing the vegetative cover and damaging soil structure that limit erosion under existing conditions.

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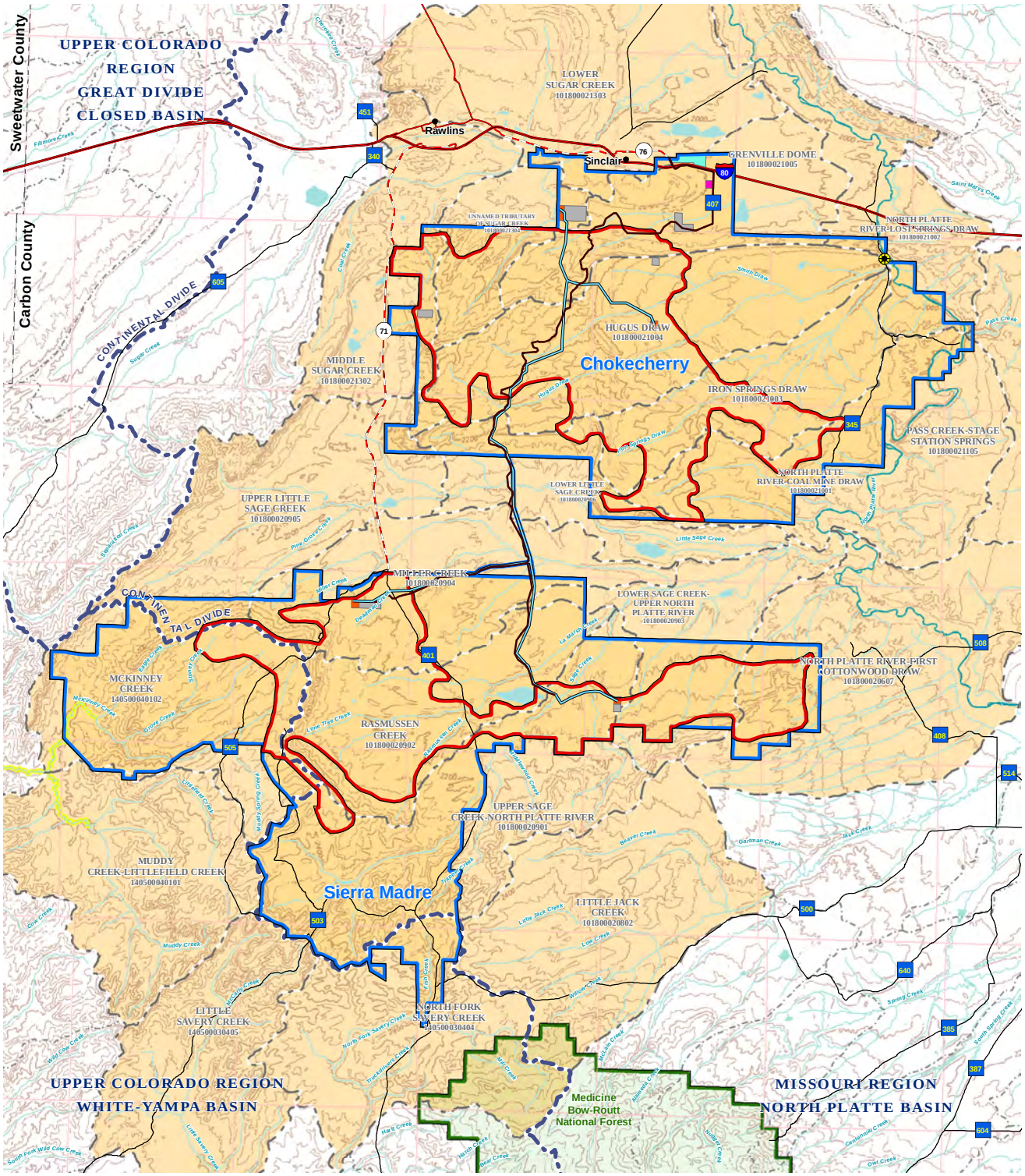

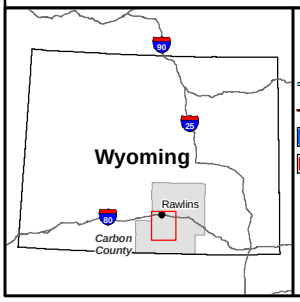

Legend

- Transmission Line
- Haul Road
- Project Area
- Likely Area of Turbine Construction

Project Facilities

- Water Extraction Site
- Alternate O&M Facility
- Intermodal Rail Facility
- Staging Area (Construction Only)
- Substation

- Continental Divide
- River or Creek
- Threatened Stream Reach
- Lake or Reservoir
- Water Resources Analysis Area
- Hydrologic Basin

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.13-1

Impacts to Water Resources from Alternative 1R

0 1 2 4 Miles
0 2 4 8 Kilometers
1:320,000
N

Road-stream crossings could include low-water crossings, culverts, or bridges (temporary and/or permanent). Low-water crossings would require the least amount of initial disturbance, but are only applicable to drainages with no flow for the majority of the year (e.g., ephemeral streams). Low-water crossings cannot be used during run-off events that cause excess flows at a crossing. Culverts are generally the preferred crossing method. Impacts to channel geometry and stability can occur from improper installations. Temporary bridges could be utilized during the construction phase for temporary roads. Permanent bridges are economically limited in their applicability for access roads. Bridge installation also would require the largest initial disturbance for foundation construction and potential pier placements.

Construction disturbance in the Upper Muddy Creek watershed improvement Application Area (within White-Yampa Basin) totals 418 acres and represents approximately 0.7 percent of the improvement area. Construction disturbance in the Sage Creek watershed improvement Application Area (within North Platte Basin) totals 2,585 acres, which represents a disturbance range from approximately 0.9 percent in Lower Little Sage Creek sub-watershed to 3.7 percent in Rasmussen Creek sub-watershed.

No impacts to groundwater quality are anticipated from construction due to the relatively high elevation locations and shallow excavation depth of turbines.

Operational disturbance decreases as construction disturbance not needed for operation is reclaimed. A portion of this decrease is due to the completion of reclamation of staging areas and concrete batch plants and of decreased access road ROW width, some of which are located in the lower elevation areas. The sub-watersheds with the highest percentage of operation disturbance are 101800021304 (Sugar Creek) and Grenville Dome, both with 1.1 percent disturbance.

Operational disturbance in the Upper Muddy Creek watershed improvement Application Area totals 107 acres, which represents approximately 0.3 percent of the McKinney Creek sub-watershed. Operational disturbance in the Sage Creek watershed improvement Application Area totals 416 acres, which represents a disturbance range from approximately 0.2 percent of the Upper Sage Creek-North Platte River sub-watershed to 0.5 percent of the Rassmussen Creek sub-watershed.

There are multiple BMPs and ACMs that can, if properly implemented, minimize the impacts of surface disturbance to water resources. Disturbance activities within 500 feet of perennial waters, 100 feet of ephemeral waters, and within drainage bottoms and riparian areas would be avoided to the maximum extent practicable. Where these features cannot be completely avoided, such as in the case of access road-stream crossings, impacts would be minimized through design modifications and the use of erosion control and channel stabilizing measures (e.g., culverts, culvert outlet protection, energy dissipating structures, rock/rip rap embankments). All structures crossing streams would be located and constructed according to the BLM Gold Book (2007) and BLM Manual 9113 so that changes to channel geometry and water velocity are minimized.

Disturbance that occurs in upland locations would be minimized through the use of erosion control devices (e.g., silt fences, jute netting, hay bales, water bars, check dams, berms, shallow swales, mulches). Road designs would not exceed 10 percent grade and would avoid changing existing surface water runoff patterns by following natural contours and utilizing roadside ditches and subsurface culverts. Excessive grades would be avoided on roads, road embankments, ditches, and drainages whenever possible. See Section 2.3.3.3 for further information.

Storm water management would be implemented as defined in the Stormwater Pollution Prevention Plan (SWPPP) (POD, Appendix F), which includes monitoring and maintenance of all control devices and structures during active construction on one of two schedules: at least once every 14 days and within 24 hours of a precipitation event greater than 0.5 inch, or at least once every 7 days. After active construction is finished but complete reclamation has not yet occurred, these structures and devices

would be inspected at least once every month. SWPPP review would be completed by WDEQ-WQD in collaboration with the BLM, WGFD, Conservation Districts, and other cooperators to simultaneously meet the requirements of the storm water permit and allow the BLM and cooperators review and comment on the BMP monitoring plan.

Upon completion of construction, reclamation of disturbed areas not required for operation would be undertaken as early as possible using weed-free native grasses, forbs, and shrubs. Control of weeds could entail the use of herbicides, which would be performed in accordance with a BLM-approved Weed Management Plan. During operation, roads would be inspected on a regular basis and following snowmelt or heavy or prolonged rainfall to identify maintenance needs to road crowns and outslopes, and for clearing sediment or debris blocking ditches and culverts. Maintenance would be performed as necessary.

Properly implemented BMPs and ACMs used during construction and operation would minimize impacts of surface disturbance on water quality and quantity. For instance, measures such as low-flow crossings and culverts would be installed at stream crossings during construction to control erosion and stabilize stream channels.

Water use for construction of this alternative would include concrete batching for the WTG foundations, dust abatement, and compaction of access roads. Water use is addressed in the POD, and a potential water consumption schedule was provided by PCW (PCW 2010c). Based on this information the BLM estimates that the proposed project would consume approximately 500 acre-feet, with the maximum water use in the first year, totaling 285 acre-feet in that year (57 percent of total construction water). Using these estimates, the total amount of water consumptively used during construction of this alternative would be approximately 0.04 acre-feet per turbine constructed, 0.71 acre-feet per mile of road constructed for compaction, and 0.44 acre-feet per mile of road for dust abatement during construction. The maximum annual volume of water consumed equates to approximately 0.04 percent of the North Platte River's average annual flow near Sinclair of nearly 810,000 acre-feet per year (USGS 2010). PCW estimates that 10 percent of this water (29 acre-feet) may come from the White-=Yampa Basin within the Upper Colorado River drainage (PCW 2010c), which equates to 0.20 percent of Muddy Creek's average annual flow near Baggs of nearly 14,000 acre-feet per year, or 0.04 percent of Savery Creek's average annual flow near Savery of approximately 72,000 acre-feet per year (USGS 2010). **Table 4.13-3** tabulates the water use by year and basin following the rationale described above. Similar to the No Action alternative, water use would not be allowed to impact current water users or interstate agreements through the water rights processes required by the WSEO. Water that is currently being consumed by permitted beneficial use may be temporarily changed for construction use under these processes. No net increases in water consumption are anticipated, nor are changes anticipated to existing return flow timing or volumes. Part of this temporary change process is consultation under Section 7 of the ESA. See Sections 3.15 and 4.15 for more information on endangered species consultation. There are numerous irrigation, stock, domestic, and reservoir supply rights that are owned by the proponent in the area that may be proposed for the temporary change process.

Magnesium-chloride ($MgCl_2$) has been proposed by PCW for use in road dust abatement. Several studies performed along roadways in Colorado where $MgCl_2$ has been used as a dust inhibitor or a deicer indicate that its use might increase the levels of these constituents in waterways depending on application rates, road proximity to waterway, and weather patterns, among others. These studies show that the increases did not approach concentration limits implemented by WDEQ or USEPA in water quality classifications or drinking water secondary standards, respectively (Goodrich et al. 2009; Lewis 1999; Stevens 2010).

During the operation of the project, approximately 30 acre-feet of water per year would be needed for dust abatement of roads. The source of this water and the process for temporarily changing the use would be the same as discussed under the construction impacts. Potential spills of hazardous materials

from construction equipment would be addressed in the project's SPCC Plan (POD, Appendix T). This plan includes measures such as secondary containment at all on-site hazardous materials and waste storage facilities, including fuel. The SPCC Plan also defines procedures to be followed in the case of an accidental spill from a vehicle or equipment. No degradation to surface water or groundwater quality would be anticipated.

Table 4.13-3 Water Use Analysis for Construction of Alternative 1R

	Total	Year 1	Year 2	Year 3	Year 4
Percent Estimated Water Consumption by Year		57%	16%	14%	13%
Total Estimated Project Water Consumption (acre-feet)	500	285	82	71	63
Percent Average Annual North Platte River Runoff Consumed by Project		0.04%	0.01%	0.01%	0.01%
10% of Estimated Project Water Consumption (acre-feet)	50	29	8	7	6
Percent Average Annual Muddy Creek Runoff Consumed by Project		0.20%	0.06%	0.05%	0.05%
Percent Average Annual Savery Creek Runoff Consumed by Project		0.04%	0.01%	0.01%	0.01%
North Platte River Average Annual Runoff (acre-feet)	807,352				
Muddy Creek Average Annual Runoff (acre-feet)	13,979				
Savery Creek Average Annual Runoff (acre-feet)	72,354				

No permanent project components would be located within FEMA-designated 100-year floodplains (FEMA 1987); however, the water extraction site consisting of a temporary pump location would be immediately adjacent to the North Platte River floodplain. Therefore, impacts to floodplains would not be anticipated under this alterative.

4.13.3 Impacts to Water Resources from Alternative 2, Checkerboard Only

Impacts from this alternative would be similar to those discussed under Alternative 1R. Surface disturbance within each sub-watershed during construction and operation of Alternative 2 is detailed in **Table 4.13-4** and depicted in **Figure 4.13-2**. The percentage of sub-watershed disturbance ranges from <0.1 percent to 6.5 percent during construction and from 0.1 percent to 1.2 percent during operation. There are a total of 458 locations where roads cross ephemeral streams and 7 where perennial streams are crossed under the development of this alternative.

Construction disturbance under this alternative would be greater than that for Alternative 1R and would include a shift in disturbance from the southern portion of the Application Area to the central and northern portions, especially in the lower elevations. Sub-watersheds with construction disturbance equal to or greater than 1 percent include 101800021304 (Sugar Creek), Hugus Draw, Iron Springs Draw, Grenville Dome, Rasmussen Creek, Miller Creek, McKinney Creek, Lower Sage Creek-Upper North Platte River, Middle Sugar Creek, and North Platte River-Coal Mine Draw.

Table 4.13-4 Surface Disturbance of Sub-watersheds Associated with Alternative 2

Sub-watershed Name	Sub-watershed Total Area (acres)	Alternative 2 Construction Disturbance		Alternative 2 Operation Disturbance		Stream Crossings in Sub-watershed (number)
		(acres)	(percent sub-watershed)	(acres)	(percent sub-watershed)	
North Platte Basin						
North Platte River-First Cottonwood Draw	46,942	287	0.6	57	0.1	19
Little Jack Creek	35,771	-	0.0	-	0.0	-
Upper Sage Creek-North Platte River[1]	40,935	326	0.8	55	0.1	26
Rasmussen Creek[1]	23,488	815	3.5	168	0.7	64
Lower Sage Creek-Upper North Platte River[1]	20,079	436	2.2	85	0.4	32
Miller Creek[1]	28,571	711	2.5	128	0.4	40
Upper Little Sage Creek[1]	30,732	51	0.2	10	0.0	6
Lower Little Sage Creek[1]	16,898	155	0.9	32	0.2	6
North Platte River-Coal Mine Draw	34,326	349	1.0	70	0.2	11
North Platte River-Lost Springs Draw	47,020	5	<0.1	2	<0.1	-
Iron Springs Draw	18,853	912	4.8	172	0.9	43
Hugus Draw	35,341	1,754	5.0	367	1.0	92
Grenville Dome	22,059	977	4.4	274	1.2	60
Pass Creek-Stage Station Springs	34,785	-	0.0	-	0.0	-
Middle Sugar Creek	24,897	414	1.7	69	0.3	32
Lower Sugar Creek	42,909	110	0.3	108	0.3	-
101800021304 (Sugar Creek)[2]	11,042	714	6.5	123	1.1	24
North Platte Basin Subtotals	**514,648**	**8,016**	**1.6**	**1,720**	**0.3%**	**455**

Table 4.13-4 Surface Disturbance of Sub-watersheds Associated with Alternative 2

Sub-watershed Name	Sub-watershed Total Area (acres)	Alternative 2 Construction Disturbance		Alternative 2 Operation Disturbance		Stream Crossings in Sub-watershed (number)
		(acres)	(percent sub-watershed)	(acres)	(percent sub-watershed)	
White-Yampa Basin						
North Fork Savery Creek	30,812	-	0.0	-	0.0	-
Little Savery Creek	30,995	-	0.0	-	0.0	-
Muddy Creek-Littlefield Creek[3]	32,259	-	0.0	-	0.0	-
McKinney Creek[3]	30,433	405	1.3	82	0.3	10
White-Yampa Basin Subtotals	**124,499**	**405**	**0.3**	**82**	**0.1**	**10**
Grand Totals [4]	**639,147**	**8,421**	**1.3**	**1,802**	**0.3**	**465**

[1] Sub-watersheds within the Sage Creek watershed improvement project.

[2] Some 12-digit sub-watersheds (HUs) were assigned the HUC-12 number when no GNIS name was identified on the DRGs. The name in parentheses indicates the HUC-10 name.

[3] Sub-watersheds within the Upper Muddy Creek watershed improvement project.

[4] Discrepancies in total acreage due to rounding.

Note GIS estimates use assumed component locations to generate disturbance associated with soil limitations. While these estimates may vary somewhat from disturbance estimates that were generated by assuming an average amount of disturbance associated with each project component proposed by alternative (as presented in Chapter 2.0), the difference is estimated to be less than 5 percent.

Construction disturbance in the Upper Muddy Creek watershed improvement Application Area totals 405 acres, which represents approximately 1.3 percent of the McKinney Creek sub-watershed. Construction disturbance in the Sage Creek watershed improvement Application Area totals 2,494 acres, which represents a disturbance range from approximately 0.2 percent in Upper Little Sage Creek sub-watershed to 3.5 percent in Rasmussen Creek sub-watershed. The construction disturbance within each of these areas increases under this alternative as compared to Alternative 1R.

Surface disturbance during project operations would be greater than the disturbance under Alternative 1R, with a shift in disturbance from the south to the north portion of the Application Area, including lower elevations. Sub-watersheds with operation disturbance equal to or greater than 1 percent include Grenville Dome, 101800021304 (Sugar Creek), and Hugus Draw.

Operational disturbance in the Upper Muddy Creek watershed improvement Application Area totals 82 acres and is approximately 0.3 percent of the McKinney Creek sub-watershed. Operation disturbance in the Sage Creek watershed improvement Application Area totals 478 acres, which represents a disturbance range from approximately 0.1 percent in Upper Sage Creek-North Platte River sub-watershed to 0.7 percent in Rasmussen Creek sub-watershed. The operation disturbance within each of these areas also increases under this alternative as compared to Alternative 1R.

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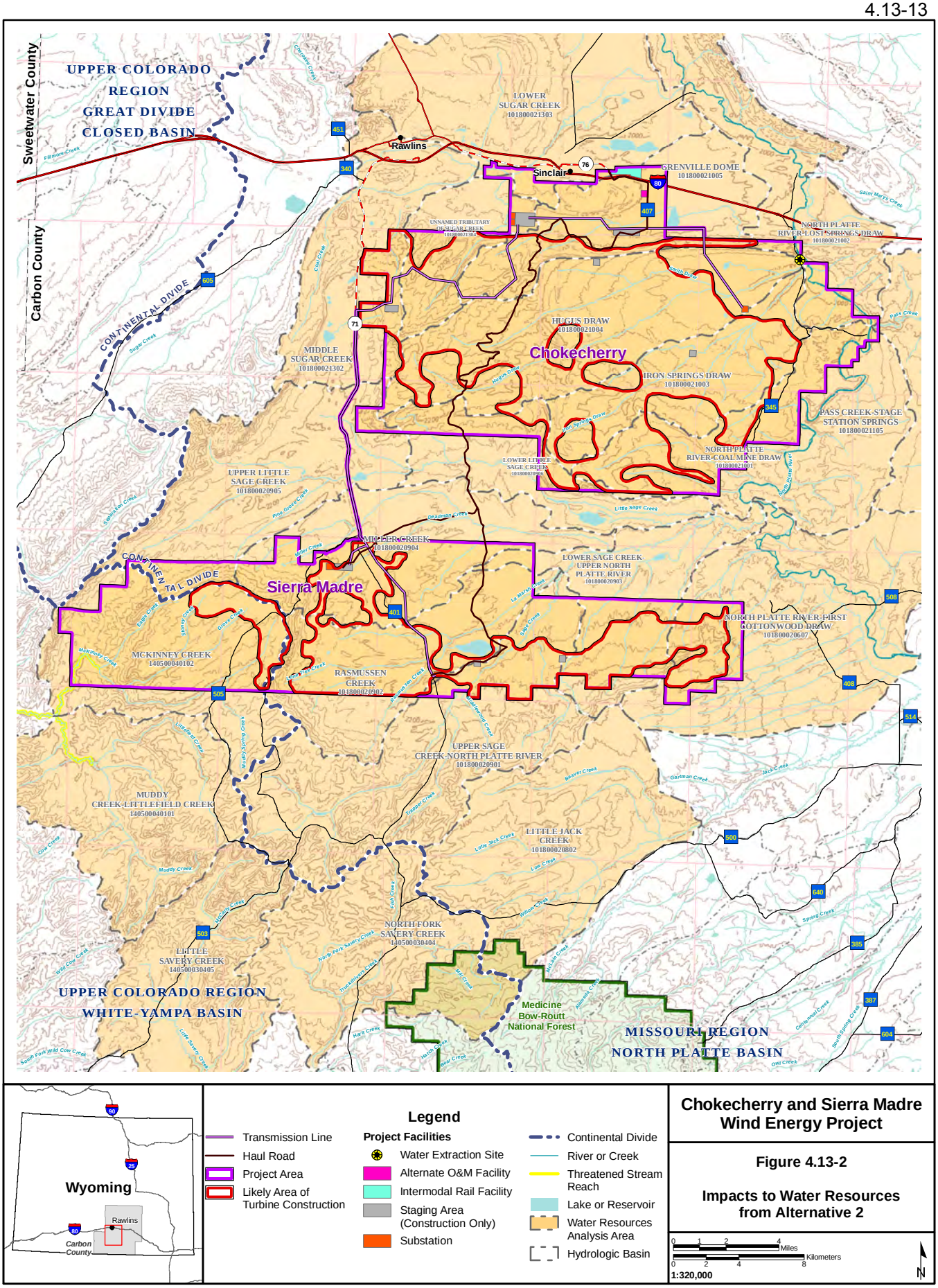

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.13-2

Impacts to Water Resources from Alternative 2

Water use for construction of this alternative would include the same uses as Alternative 1R. Based on the same information used under Alternative 1R, the BLM estimates that this alternative would consume approximately 603 acre-feet, which is 21 percent more water than Alternative 1R. The maximum water use would occur in the first year and total 344 acre-feet (57 percent of total construction water). The maximum annual volume of water used equates to approximately 0.04 percent of the North Platte River's average annual flow near Sinclair of nearly 810,000 acre-feet per year (USGS 2010). PCW estimates that 10 percent of this water (34 acre-feet) may come from the White-Yampa Basin within the Upper Colorado River drainage (PCW 2010c), which equates to 0.25 percent of Muddy Creek's average annual flow near Baggs of nearly 14,000 acre-feet per year, or 0.05 percent of Savery Creek's average annual flow near Savery of approximately 72,000 acre-feet per year (USGS 2010). **Table 4.13-5** tabulates the water use by year and basin. Similar to Alternative 1R, water that is currently being consumed by permitted beneficial use may be temporarily changed for construction use under WSEO processes. No net increases in water consumption are anticipated, nor are changes anticipated to existing return flow timing or volumes.

Table 4.13-5 Water Use Analysis for Construction of Alternative 2

	Total	Year 1	Year 2	Year 3	Year 4
Percent Estimated Water Consumption by Year		57%	16%	14%	13%
Total Estimated Project Water Consumption (acre-feet)	603	344	96	84	78
Percent Average Annual North Platte River Runoff Consumed by Project		0.04%	0.01%	0.01%	0.01%
10% of Estimated Project Water Consumption (acre-feet)	60	34	10	8	8
Percent Average Annual Muddy Creek Runoff Consumed by Project		0.25%	0.07%	0.06%	0.06%
Percent Average Annual Savery Creek Runoff Consumed by Project		0.05%	0.01%	0.01%	0.01%
North Platte River Average Annual Runoff (acre-feet)	807,352				
Muddy Creek Average Annual Runoff (acre-feet)	13,979				
Savery Creek Average Annual Runoff (acre-feet)	72,354				

Water use impacts during operation and decommissioning would be similar to those discussed under Alternative 1R.

Potential spills of hazardous materials would be similar to those discussed under Alternative 1R.

Floodplain impacts would be similar to those discussed under Alternative 1R.

4.13.4 Impacts to Water Resources from Alternative 3, No Miller Hill or Sierra Madre

Impacts might occur in the same ways as discussed under Alternative 1R. Land disturbance within each sub-watershed during construction and operation of Alternative 3 is detailed in **Table 4.13-6** and depicted in **Figure 4.13-3**. Sub-watersheds with disturbance range from <0.1 percent to 6.6 percent disturbance during construction and from <0.1 percent to 1.3 percent disturbance during operation. There are a total of 450 locations where roads cross ephemeral streams and 7 where perennial streams are crossed.

Table 4.13-6 Surface Disturbance of Sub-watersheds Associated with Alternative 3

Sub-watershed Name	Sub-watershed Total Area (acres)	Alternative 3 Construction Disturbance		Alternative 3 Operation Disturbance		Stream Crossings in Sub-watershed (number)
		(acres)	(percent sub-watershed)	(acres)	(percent sub-watershed	
North Platte Basin						
North Platte River-First Cottonwood Draw	46,942	278	0.6	56	0.1	16
Little Jack Creek	35,771	-	0.0	-	0.0	-
Upper Sage Creek-North Platte River[1]	40,935	312	0.8	57	0.1	26
Rasmussen Creek[1]	23,488	775	3.3	158	0.7	59
Lower Sage Creek-Upper North Platte River[1]	20,079	486	2.4	96	0.5	36
Miller Creek[1]	28,571	717	2.5	114	0.4	40
Upper Little Sage Creek[1]	30,732	51	0.2	10	<0.1	6
Lower Little Sage Creek[1]	16,898	154	0.9	32	0.2	6
North Platte River-Coal Mine Draw	34,326	395	1.2	79	0.2	13
North Platte River-Lost Springs Draw	47,020	5	<0.1	2	<0.1	-
Iron Springs Draw	18,853	963	5.1	182	1.0	44
Hugus Draw	35,341	1,906	5.4	397	1.1	93
Grenville Dome	22,059	1,003	4.5	279	1.3	60
Pass Creek-Stage Station Springs	34,785	-	0.0	-	0.0	-
Middle Sugar Creek	24,897	413	1.7	69	0.3	32
Lower Sugar Creek	42,909	110	0.3	108	0.3	-
101800021304 (Sugar Creek)[2]	11,042	734	6.6	128	1.2	26
North Platte Basin Subtotals	514,648	8,301	1.6	1,766	0.3	457
White-Yampa Basin						
North Fork Savery Creek	30,812	-	0.0	-	0.0	-
Little Savery Creek	30,995	-	0.0	-	0.0	-

Table 4.13-6 Surface Disturbance of Sub-watersheds Associated with Alternative 3

Sub-watershed Name	Sub-watershed Total Area (acres)	Alternative 3 Construction Disturbance		Alternative 3 Operation Disturbance		Stream Crossings in Sub-watershed (number)
		(acres)	(percent sub-watershed)	(acres)	(percent sub-watershed	
Muddy Creek-Littlefield Creek[3]	32,259	-	0.0	-	0.0	-
McKinney Creek[3]	30,433	-	0.0	-	0.0	-
White-Yampa Basin Subtotals	**124,499**	**0**	**0.0**	**0**	**0.0**	**0**
Grand Totals[4]	**639,147**	**8,301**	**1.3**	**1,766**	**0.3**	**457**

[1] Sub-watersheds included in Sage Creek watershed improvement project.

[2] Some 12-digit sub-watersheds (HUs) were assigned the HUC-12 number when no GNIS name was identified on the DRGs. The name in parentheses indicates the HUC-10 name.

[3] Sub-watersheds included in Upper Muddy Creek watershed improvement project.

[4] Discrepancies in total acreage due to rounding.

Note: GIS estimates use assumed component locations to generate disturbance associated with soil limitations. While these estimates may vary somewhat from disturbance estimates that were generated by assuming an average amount of disturbance associated with each project component proposed by alternative (as presented in Chapter 2.0), the difference is estimated to be less than 5 percent.

Construction disturbance under this alternative would be less in the southern portion of the Application Area, which increases disturbance of the central and northern portions, especially in the lower elevations, as compared to Alternatives 1R and 2. Sub-watersheds with construction disturbance equal to or greater than 1 percent includes 101800021304 (Sugar Creek), Hugus Draw, Iron Springs Draw, Grenville Dome, Rasmussen Creek, Miller Creek, Lower Sage Creek-Upper North Platte River, Middle Sugar Creek, and North Platte River-Coal Mine Draw.

Construction disturbance in the Upper Muddy Creek watershed improvement Application Area would be completely eliminated. Construction disturbance in the Sage Creek watershed improvement Application Area totals 2,495 acres, which represents a disturbance range from approximately 0.2 percent in Upper Little Sage Creek sub-watershed to 3.3 percent in Rasmussen sub-watershed, which is an increase from both Alternatives 1R and 2.

Operation disturbance would be similar to Alternative 2, with the exception of the shift from the south to the north discussed under construction disturbance above. Sub-watersheds with operation disturbance equal to or greater than 1 percent include Grenville Dome, Hugus Draw, 101800021304 (Sugar Creek) and Iron Springs Draw.

Operation disturbance in the Upper Muddy Creek watershed improvement Application Area would be eliminated. Operation disturbance in the Sage Creek watershed improvement Application Area totals 468 acres and sub-watersheds with disturbance range from <0.1 percent in Upper Little Sage Creek sub-watershed to 0.7 percent in Rasmussen Creek sub-watershed, which also is an increase from Alternatives 1R and 2.

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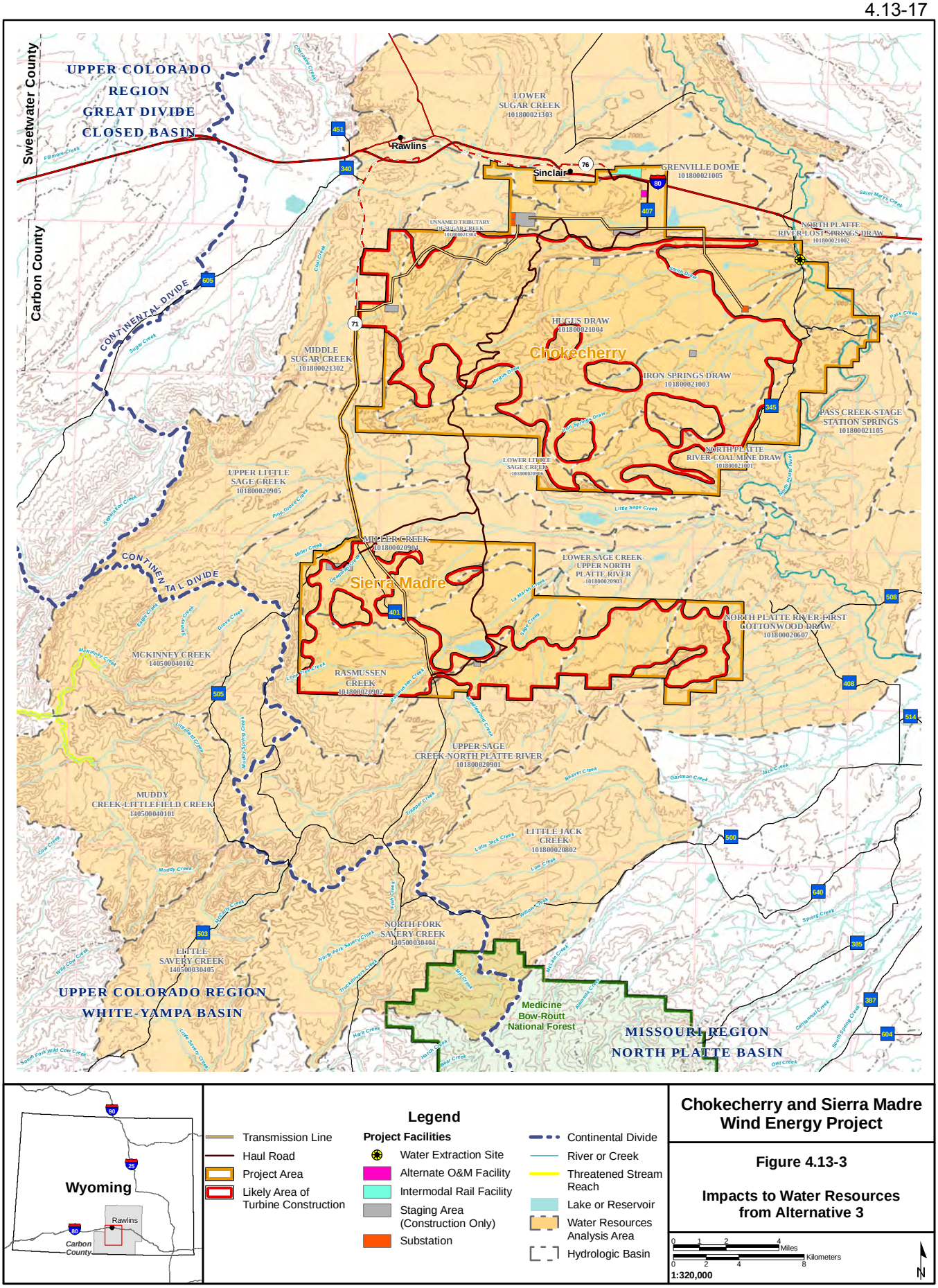

Legend

- Transmission Line
- Haul Road
- Project Area
- Likely Area of Turbine Construction

Project Facilities

- Water Extraction Site
- Alternate O&M Facility
- Intermodal Rail Facility
- Staging Area (Construction Only)
- Substation

- Continental Divide
- River or Creek
- Threatened Stream Reach
- Lake or Reservoir
- Water Resources Analysis Area
- Hydrologic Basin

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.13-3

Impacts to Water Resources from Alternative 3

0 1 2 4 Miles
0 2 4 8 Kilometers
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Water use for construction of this alternative would include the same uses as Alternative 1R. Based on the same information used under Alternative 1R, the BLM estimates that this alternative would consume approximately 584 acre-feet, which is 17 percent more water than Alternative 1R. The maximum water use would occur in the first year and total 333 acre-feet (57 percent of total construction water). The maximum annual volume of water used equates to approximately 0.04 percent of the North Platte River's average annual flow near Sinclair of nearly 810,000 acre-feet per year (USGS 2010). PCW estimates that 10 percent of this water (33 acre-feet) may come from the White-Yampa Basin within the Upper Colorado River basin (PCW 2010c), which equates to 0.24 percent of Muddy Creek's average annual flow near Baggs of nearly 14,000 acre-feet per year, or 0.05 percent of Savery Creek's average annual flow near Savery of approximately 72,000 acre-feet per year (USGS 2010). **Table 4.13-7** tabulates the water use by year and basin. Similar to Alternatives 1R and 2, water that is currently being consumed by permitted beneficial use may be temporarily changed for construction use under WSEO processes. No net increases in water consumption are anticipated, nor are changes anticipated to existing return flow timing or volumes.

Table 4.13-7 Water Use Analyses for Construction of Alternative 3

	Total	Year 1	Year 2	Year 3	Year 4
Percent Estimated Water Consumption by Year		57%	16%	14%	13%
Total Estimated Project Water Consumption (acre-feet)	584	333	93	82	76
Percent Average Annual North Platte River Runoff Consumed by Project		0.04%	0.01%	0.01%	0.01%
10% of Estimated Project Water Consumption (acre-feet)	58	33	9	8	8
Percent Average Annual Muddy Creek Runoff Consumed by Project		0.24%	0.07%	0.06%	0.05%
Percent Average Annual Savery Creek Runoff Consumed by Project		0.05%	0.01%	0.01%	0.01%
North Platte River Average Annual Runoff (acre-feet)	807,352				
Muddy Creek Average Annual Runoff (acre-feet)	13,979				
Savery Creek Average Annual Runoff (acre-feet)	72,354				

Water use impacts during operation and decommissioning would be similar to those discussed under Alternatives 1R and 2.

Potential spills of hazardous materials would be similar to those discussed under Alternatives 1R and 2.

Floodplain impacts would be similar to those discussed under Alternatives 1R and 2.

4.13.5 Impacts to Water Resources from Alternative 4, Private Lands Only

Impacts might occur in the same ways as discussed under Alternative 1R. Land disturbance within each sub-watershed during construction and operation of Alternative 4 is detailed in **Table 4.13-8** and depicted in **Figure 4.13-4**. Sub-watersheds with disturbance range from less than 0.1 percent to

5.7 percent disturbance during construction and from less than 0.1 percent to 1.2 percent disturbance during operation. There are a total of 531 locations where roads cross ephemeral streams and 10 where perennial streams are crossed under the development of this alternative.

Table 4.13-8 Surface Disturbance of Sub-watersheds Associated with Alternative 4

	Sub-watershed Total Area	Alternative 4 Construction Disturbance		Alternative 4 Operation Disturbance		Stream Crossings in Sub-watershed
Sub-watershed Name	**(acres)**	**(acres)**	**(percent sub-watershed)**	**(acres)**	**(percent sub-watershed)**	**(number)**
North Platte Basin						
North Platte River-First Cottonwood Draw	46,942	200	0.4	40	0.1	20
Little Jack Creek	35,771	-	0.0	-	0.0	-
Upper Sage Creek-North Platte River[1]	40,935	457	1.1	75	0.2	37
Rasmussen Creek[1]	23,488	964	4.1	198	0.8	79
Lower Sage Creek-Upper North Platte River[1]	20,079	478	2.4	93	0.5	46
Miller Creek[1]	28,571	830	2.9	152	0.5	62
Upper Little Sage Creek[1]	30,732	54	0.2	11	<0.1	6
Lower Little Sage Creek[1]	16,898	144	0.9	30	0.2	6
North Platte River-Coal Mine Draw	34,326	429	1.3	88	0.3	21
North Platte River-Lost Springs Draw	47,020	14	<0.1	3	<0.1	1
Iron Springs Draw	18,853	926	4.9	178	0.9	50
Hugus Draw	35,341	1,753	5.0	368	1.0	102
Grenville Dome	22,059	893	4.0	258	1.2	55
Pass Creek-Stage Station Springs	34,785	-	0.0	-	0.0	-
Middle Sugar Creek	24,897	260	1.0	37	0.1	25
Lower Sugar Creek	42,909	110	0.3	108	0.3	-
101800021304 (Sugar Creek)[2]	11,042	632	5.7	107	1.0	25
North Platte Basin Subtotals	**514,648**	**8,143**	**1.6**	**1,746**	**0.3**	**535**
White-Yampa Basin						
North Fork Savery Creek	30,812	-	0.0	-	0.0	-
Little Savery Creek	30,995	-	0.0	-	0.0	-
Muddy Creek-Littlefield Creek[3]	32,259	-	0.0	-	0.0	-

Table 4.13-8 Surface Disturbance of Sub-watersheds Associated with Alternative 4

	Sub-watershed Total Area	Alternative 4 Construction Disturbance		Alternative 4 Operation Disturbance		Stream Crossings in Sub-watershed
Sub-watershed Name	**(acres)**	**(acres)**	**(percent sub-watershed)**	**(acres)**	**(percent sub-watershed)**	**(number)**
McKinney Creek[3]	30,433	278	0.9	58	0.2	6
White-Yampa Basin Subtotals	**124,499**	**278**	**0.2**	**58**	**0.0**	**6**
Grand Totals[4]	**639,147**	**8,422**	**1.3**	**1,804**	**0.3**	**541**

[1] Sub-watersheds included in Sage Creek watershed improvement project.

[2] Some 12-digit sub-watersheds (HUs) were assigned the HUC-12 number when no GNIS name was identified on the DRGs. The name in parentheses indicates the HUC-10 name.

[3] Sub-watersheds included in Upper Muddy Creek watershed improvement project.

[4] Discrepancies in total acreage due to rounding.

Note: GIS estimates use assumed component locations to generate disturbance associated with soil limitations. While these estimates may vary somewhat from disturbance estimates that were generated by assuming an average amount of disturbance associated with each project component proposed by alternative (as presented in Chapter 2.0), the difference is estimated to be less than 5 percent.

Construction disturbance under this alternative would be greater than those discussed in Alternatives 1R, 2, and 3. Because the WTG sites would be limited to private land only, the area of construction disturbance increases due to a longer length of access roads. Furthermore, the overall footprint expands in all areas to lower elevations than Alternatives 1R, 2, and 3. Construction disturbance in the Upper Muddy Creek watershed improvement Application Area totals 278 acres and is approximately 0.9 percent of the McKinney Creek sub-watershed, which is an increase under this alternative as compared to Alternative 3, but a decrease from Alternatives 1R and 2. Construction disturbance in the Sage Creek watershed improvement Application Area totals 2,926 acres and represents a range of disturbance from approximately 0.2 percent in Upper Little Sage Creek sub-watershed to 4.1 percent in Rasmussen Creek sub-watershed, which is an increase under this alternative as compared to Alternatives 1R, 2, and 3.

Operation disturbance would be greater than those discussed in Alternatives 1R, 2, and 3, for the same reasons as discussed under construction disturbance above. Operation disturbance in the Upper Muddy Creek watershed improvement Application Area totals 58 acres and is approximately 0.2 percent of McKinney Creek sub-watershed, which is a decrease from the other alternatives. Operation disturbance in the Sage Creek watershed improvement Application Area totals 558 acres and represents a disturbance range from less than 0.1 percent in Upper Little Sage Creek sub-watershed to 0.8 percent in Rasmussen Creek sub-watershed, which is an increase under this alternative as compared to Alternatives 1R, 2, and 3.

Water use for construction of this alternative would include the same uses as Alternative 1R. Based on the same information used under Alternative 1R, the BLM estimates that this alternative would consume approximately 637 acre-feet, which is 27 percent more water than Alternative 1R. The maximum water use would occur in the first year and total 363 acre-feet (57 percent of total construction water). The

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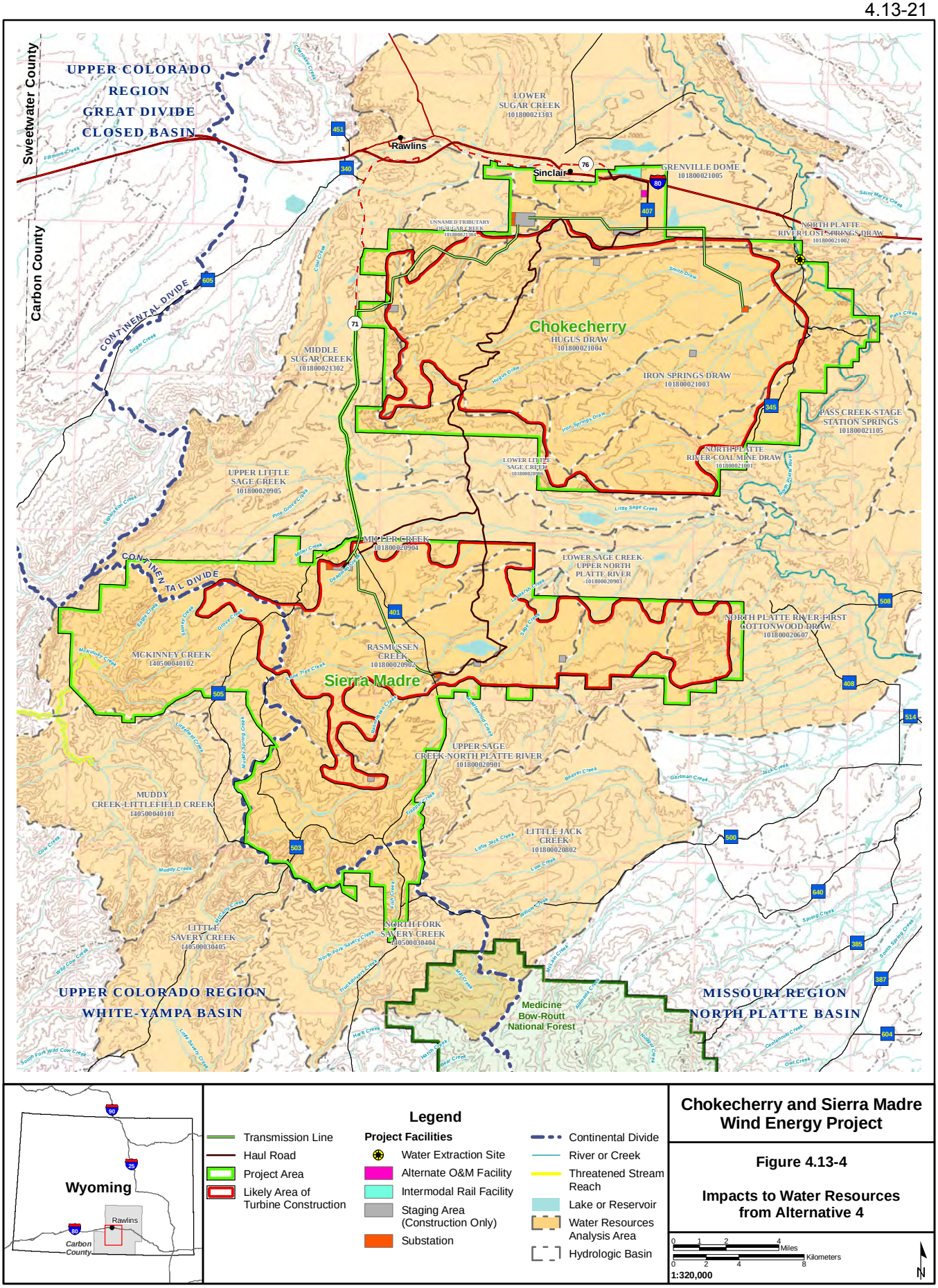

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.13-4

Impacts to Water Resources from Alternative 4

maximum annual volume of water used equates to approximately 0.04 percent of the North Platte River's average annual flow near Sinclair of nearly 810,000 acre-feet per year (USGS 2010). PCW estimates that 10 percent of this water (34 acre-feet) may come from the White-Yampa Basin within the Upper Colorado River basin (PCW 2010c), which equates to 0.26 percent of Muddy Creek's average annual flow near Baggs of nearly 14,000 acre-feet per year, or 0.05 percent of Savery Creek's average annual flow near Savery of approximately 72,000 acre-feet per year (USGS 2010). **Table 4.13-9** tabulates the water use by year and basin. Similar to Alternatives 1R, 2, and 3, water that is currently being consumed by permitted beneficial use may be temporarily changed for construction use under WSEO processes. No net increases in water consumption are anticipated, nor are changes anticipated to existing return flow timing or volumes.

Table 4.13-9 Water Use Analysis for Construction of Alternative 4

	Total	Year 1	Year 2	Year 3	Year 4
Percent Estimated Water Consumption by Year		57%	16%	14%	13%
Total Estimated Project Water Consumption (acre-feet)	637	363	102	89	83
Percent Average Annual North Platte River Runoff Consumed by Project		0.04%	0.01%	0.01%	0.01%
10% of Estimated Project Water Consumption (acre-feet)	64	36	10	9	8
Percent Average Annual Muddy Creek Runoff Consumed by Project		0.26%	0.07%	0.06%	0.06%
Percent Average Annual Savery Creek Runoff Consumed by Project		0.05%	0.01%	0.01%	0.01%
North Platte River Average Annual Runoff (acre-feet)	807,352				
Muddy Creek Average Annual Runoff (acre-feet)	13,979				
Savery Creek Average Annual Runoff (acre-feet)	72,354				

Water use impacts during operation and decommissioning would be similar to those discussed under Alternatives 1R, 2, and 3.

Potential spills of hazardous materials would be similar to those discussed under Alternatives 1R, 2, and 3.

Floodplain impacts would be similar to those discussed under Alternatives 1R, 2, and 3.

4.13.6 Mitigation and Mitigation Effectiveness

All action alternatives would incorporate ACMs and BMPs described in Chapter 2.0 and found in **Appendix C**.

GEN-1: The phased construction sequence mitigation, which is discussed in Section 2.2, and further defined in **Appendix A**, would provide beneficial aspects to water resources. This measure would

generally limit the amount of initial construction disturbance to those areas that would have turbine construction occur within 12 months and mitigation effectiveness.

Effectiveness: This mitigation measure would not decrease the total area disturbed by Project development as discussed in the above alternatives, but would decrease incremental impacts to water resources in the following ways.

- The magnitude of water quality impacts due to erosion in disturbed areas would decrease under phased construction given the reduced time between construction and reclamation of wide (construction) road segments of 94 feet down to the long-term (operational) width of 20 feet. In addition, portions of the Application Area, such as sub-watersheds in the Chokecherry area, would remain largely undisturbed for the first several years of the construction period.
- Stream crossings would be constructed over multiple years rather than in the first year of construction, decreasing the number of locations that high flow events would impact at any given time. This would result in the ability to focus attention on problem areas in a timelier manner, reducing the potential for long term impacts from failed BMPs.
- The POD assumes use of 45 million gallons of water would be used for road watering, and an additional 80 million gallons of water would be used for road compaction (POD, Table 23). By distributing road construction over the course of 4 years instead of 1, total water use would be distributed over a longer period of time, thereby distributing the impacts to flow in the North Platte River relatively equally over the 4 year construction period rather than focusing most of the impact in the first year.

The following mitigation measures are common to all alternatives:

WR-1: Stream water quality monitoring sites will be identified by the BLM. Stream monitoring shall continue through construction, operation, and decommissioning of the project by the applicant to monitor for changes in water quality.

WR-2: PCW will be required to submit the site-specific SWPPP as part of the ROW grant application for approval by the BLM.

WR-3: Erosion pin cross section and longitudinal profile transects would be monitored through complete restoration of the project at BLM-established locations within the Application Area. Monitoring would consist of annual measurements at erosion pins. If monitoring indicates that the established erosion control measures do not minimize upland erosion impacts, additional mitigation will be developed.

Effectiveness: Mitigation measures 1 and 3 would provide data to quantify the project-related impacts of sedimentation and erosion control on water quality. This would assist the BLM in determining the effectiveness of the implemented BMPs and evaluate the need for additional measures through adaptive management. Mitigation measure 2 would provide the BLM an opportunity for input to the SWPPP ahead of issuing any ROW grant to determine compliance with BLM-required BMPs.

4.13.7 Residual Impacts

Mitigation measures are designed to identify and reduce impacts to water resources but do not fully mitigate the impacts. All of the alternatives would result in the potential for site specific increases of upland erosion during construction and initial reclamation, thereby increasing sedimentation to streams. Long term increases in erosion would be expected due to the continued use of constructed roads.

4.13.8 Irreversible and Irretrievable Commitment of Resources

Irreversible impacts to surface water are not anticipated since environmental measures, including reclamation, would mitigate effects on water quantity and quality over time.

Temporary reductions in water quality from erosion and sedimentation would be irretrievable. Water consumptively used during the project would be irretrievable; however, because no new depletions are allowed, the water needed for the project must be obtained from sources with existing water rights currently and historically used for another purpose or must be covered under the Wyoming depletion plan. Water rights intended for use during this project must be converted to industrial use through established WSEO procedures before construction can be approved.

4.13.9 Relationship between Local Short-term Uses and Long-term Productivity

Short-term increases in erosion and decreases in bank vegetation could potentially impact long-term channel stability.

4.14 Impacts to Wildlife and Fisheries Resources

4.14.1 General Wildlife

Potential wildlife impacts from construction and operation of the proposed project can be grouped into two main categories, loss of habitat and mortality. Habitat loss can be further identified into initial and long-term impacts. Initial impacts accounts for all disturbance during construction of the project. Long-term impacts are defined as impacts that remain after reclamation and will last at least as long as the project is in operation. Examples of long-term direct impacts include areas where operation facilities (e.g., roads, tower pads, substations) are located and habitat cannot be reclaimed until after the end of the project's design life (decommissioning). Habitat impacts can further be categorized as direct and indirect. Direct habitat impact results when habitat is destroyed or converted to a form that is unusable by the affected species, and is typically long-term. The primary potential indirect impact of the proposed project is wildlife avoidance (displacement) of otherwise suitable habitat in the Application Area, even when the habitat is relatively undisturbed by the project. Indirect impacts are more difficult to quantify than direct impacts because for most wildlife species there is limited scientific data available describing thresholds. Habitat loss and/or displacement impacts also may result in habitat fragmentation, the separation of a block of habitat for a species into fragments, such that the genetic or demographic viability of the populations' surviving in the remaining habitat fragments is reduced (Wind Turbine Guidelines Advisory Committee 2010).

Displacement of wildlife species could potentially have the most significant impact on wildlife. Displacement could occur initially from construction. Avoidance of the disturbed areas, facility infrastructure (e.g., turbines and roads where increased human activity and noise levels is likely to occur) during operations and maintenance would likely result in a long-term impact for some species. The response to these potential impacts likely varies considerably with each wildlife species. Potential consequences from displacement include lower survival, lower reproductive success, lower recruitment, and ultimately lower carrying capacity and reduced populations (WGFD 2004b). These consequences are dependent upon the condition of the adjacent, undisturbed areas, and/or whether the impacts are sufficient to cause habitat fragmentation. If adjacent areas are at carrying capacity wildlife populations would likely be reduced, as a result of competition with animals already in adjacent areas or the use of less optimal habitat. Likewise, if habitats are fragmented, the areas carrying capacity will be reduced for those species impacted.

The extent of wildlife displacement is difficult to predict for most species, although data for other development activities suggest that the response severity will likely vary from species to species and can even vary between different individuals of the same species. After initial avoidance, some wildlife species may acclimate to the activity and begin to use areas previously avoided. This acclimation and reoccupation is most likely to occur following construction when the project moves into the operational phase when noise and human activity would be much reduced. Habitat fragmentation and isolation are difficult to determine and vary by species to species. Although these wind energy projects do not typically create physical barriers to wildlife movement, the effective use of adjacent undisturbed habitats could diminish as densities of infrastructure and roads increase.

The road network constructed to service turbines would affect terrestrial and aquatic communities (Kuvlesky et al. 2007). There are seven general impacts to wildlife habitat associated with roads including: 1) increased morality from road construction; 2) increased mortality from collision with vehicles; 3) modification of animal behavior; 4) alteration of the physical environment; 5) alteration of the chemical environment; 6) spread of exotic species; and 7) increased alteration and use of habitats by humans (Trombulak and Frissell 2000). Not all species and ecosystems are equally affected by roads, but overall the presence of roads is highly correlated with changes in the species composition, population sizes, and hydrologic and geomorphic processes that shape aquatic and riparian systems (Trombulak and Frissell 2000).

Reclamation within construction zones should result in re-establishment of vegetation and soil stabilization in these areas over a relatively short time period. Grasses and forbs are expected to become established within the first several years following reclamation however shrub re-establishment to pre-disturbance levels would not be achieved for up to 20 to 30 years (depending on the species), delaying the return of suitable habit for some species. In this case, the impacts of the project on vegetation and soil stability would occur initially, but the impact on shrub dependent species would be long-term.

4.14.1.1 Wildlife and Fisheries Resources Impact Analysis Considerations

The environmental constraints map (**Figure 2-1**) represents the known locations of wildlife resource concerns within the Application Area. Although the turbine layouts of the alternatives avoid these areas, it is recognized that the exact location of turbines are not finalized. The analysis of impacts to wildlife assumes the final layout for turbines will adhere to constraints depicted on this map.

The Final EIS for the Rawlins RMP presents management considerations (Chapter 2.0) for wildlife and fisheries that were considered during the analyses for impacts to wildlife and fisheries resources. BLM's management goals, objectives, and actions for managing general wildlife and fisheries and consumptive uses are listed in **Table 4.14-1** (BLM 2008b). Additionally, the specific management goals, objectives, and actions associated with the Upper Muddy Creek Watershed/Grizzly WHMA also are presented in **Table 4.14-1** (BLM 2008b).

For some wildlife and fish resources additional management considerations were assessed and are presented in **Table 4.14-2**. Additionally, scoping issues specifically addressing wildlife resources also are summarized and included in **Table 4.14-2**.

Table 4.14-1 Relevant Management Considerations for Wildlife and Fisheries

BLM RMP and ROD – Wildlife and Fisheries
<u>General Wildlife and Fisheries Management Objectives</u> • Maintain, restore, or enhance wildlife habitat in coordination and consultation with other local, state, and federal agencies and consistent with other agency plans, policies, and agreements. A full range of mitigation options will be considered when developing mitigation for project-level activities for wildlife and Special Status Species habitats. • Maintain, restore, or enhance T&E species habitat, in coordination and consultation with the USFWS and other local, state, and federal agencies and consistent with other agency plans, policies, and agreements. • Maintain, restore, or enhance designated BLM State Sensitive Species habitat in order to prevent listing under the ESA, in coordination and consultation with other local, state, and federal agencies and consistent with other agency plans, policies, and agreements. • Maintain, restore, or enhance habitat function in crucial winter range. <u>Upper Muddy Creek Watershed/ Grizzly WHMA Objectives</u> • Maintain, restore, and enhance crucial winter habitat for elk and mule deer. • Maintain, restore, and enhance habitat for the Colorado River fish species unique to the Muddy Creek watershed. • Implement an MOU with appropriate state or local agency having jurisdiction or ownership of state lands and pursue opportunities for partnership and cooperative management with adjacent property owners. • Utilize inventory and monitoring data to support habitat management.

Table 4.14-1 Relevant Management Considerations for Wildlife and Fisheries

BLM RMP and ROD – Wildlife and Fisheries
• Utilize an integrated management approach (e.g., mechanical, chemical, biological, prescribed fire, wildlife, and livestock grazing) to enhance vegetation communities to achieve objectives for the area.
General Wildlife and Fisheries Management Goals • Manage for the biological integrity and habitat function of terrestrial and aquatic ecosystems to sustain and optimize distribution and abundance of all native, desirable non-native, and Special Status fish and wildlife species. • Manage or restore habitat to conserve, recover, and maintain populations of native, desirable non-native, and Special Status Species (e.g., BLM State Sensitive Species, WGFD Species of Greatest Conservation Need, Native Species Status 1 to 2 species, USFWS listed/proposed/ candidate species) consistent with appropriate local, state, and federal management plans and policies. • Manage for quality habitat to support the introduction, reestablishment, augmentation, transplant, stocking, and expansion of identified high-priority fish and wildlife species, in consultation and coordination with appropriate local, state, and federal agencies and adjacent landowners. • Manage wildlife and fish habitat to support recreational and educational benefits and opportunities for the public. Upper Muddy Creek/Grizzly WHMA Management Goals • Manage habitat for the Colorado River fish species unique to the Muddy Creek watershed. • Manage crucial winter habitat for elk and mule deer. • Seek the cooperation of owners of adjacent property in management of the habitat.
General Wildlife and Fisheries Management Actions • BLM would work cooperatively with other agencies and affected landowners for the introduction, transplant, reestablishment, augmentation, and/or stocking of wildlife and fish species. • Surface disturbing and disruptive activities would be intensively managed in all raptor concentration areas to reduce physical disturbance of raptor habitat and disturbance to the birds. This would entail a case-by-case examination of proposals. • Wildlife habitat objectives would be considered in all reclamation activity. • Manage projects through facility placement and minimization of construction disturbance to maintain connectivity between large contiguous blocks of undisturbed habitat. • Manage wildlife and fisheries habitat to meet the Wyoming Standards for Healthy Rangelands. Upper Muddy Creek/Grizzly WHMA Management Actions • The Upper Muddy Creek Watershed/Grizzly area will be managed as a WHMA. • To protect the Colorado River cutthroat trout reintroduction area, 4,520 acres of public lands and 69,770,000 tons of federal coal are unsuitable for further leasing consideration. • Rehabilitation of degraded stream reaches will be carried out in specific problem areas. Livestock grazing use will be managed for the protection or enhancement of resource values for which the WHMA was designated. • The area is closed to new oil and gas leasing. Surface disturbing activities on existing leases will be intensively managed. • Public lands are open to locatable mineral entry.

Table 4.14-1 Relevant Management Considerations for Wildlife and Fisheries

BLM RMP and ROD – Wildlife and Fisheries
• Lands will be managed in accordance with 43 CFR 3809.11, Plans of operation are required for locatable mineral exploration and development (except casual use), for disturbances of 5 acres or more. • Public lands are closed to mineral material disposals. • Public lands are open to the operation of the public land laws. • Off-road motor vehicle use for “necessary tasks” is allowed. • Motorized vehicle use is limited to designated roads and vehicle routes. Closures of specific roads and vehicle routes, including seasonal closures, will be considered on a case-by-case basis to meet the objectives of the Upper Muddy Creek Watershed/Grizzly WHMA. • OHV use to retrieve big game kills or access camp sites is prohibited off designated roads and vehicle routes. • Surface disturbing activities will avoid identified 100-year floodplains, 500 feet from perennial surface water and/or wetland and riparian areas, and 100 feet from ephemeral channels. Exceptions to this would be granted by the BLM based on an environmental analysis and site-specific engineering and mitigation plans. Only those actions within areas that cannot be avoided and that provide protection for the aquatic resources in the Upper Muddy Creek Watershed/Grizzly WHMA will be approved. • New fence construction will be authorized according to BLM standards. Modification of existing fences to current BLM standards will be actively pursued (Appendix 19). Specific locations will be modified according to wildlife and livestock needs. • In-stream structures that interfere with the movement of native fishes among habitats will be removed, reconstructed, or retrofitted to allow fish passage. Barriers built to facilitate reintroduction efforts will be maintained until they have completed their purpose. • Actively pursue, in cooperation with WGFD, USFS, and private landowners, opportunities to expand reintroduction efforts for Colorado River Cutthroat Trout and other native cold and warm water fishes into adjacent habitats within the Upper Muddy Creek watershed. • Surface disturbing and disruptive activities in aspen communities will be avoided. Aspen stands will be managed to increase distribution and improve seral structure. • The area is designated an Appropriate Management Response fire suppression area. • Water impoundments in the Upper Muddy Creek Watershed/Grizzly WHMA that would result in storage of greater than 1 acre-foot per project in Muddy Creek will not be allowed.

Table 4.14-2 Relevant Management Considerations for Wildlife and Fish Species

Resource Topic	Management Considerations
Big Game	• Lands administered by the Wyoming Game and Fish Commission (e.g., Grizzly Unit) are managed by the WGFD (W.S. §23-1-302. W.S. §23-1-30) to restore, propagate, and protect game animals, protected animals and birds, furbearing animals, game birds, and fish.
	• Wildlife Habitat Management Plan for Red Rim and Grizzly WHMAs (BLM and WGFD 1994).
	The majority of concerns identified during scoping associated with big game and potential wind turbine impacts include: • Direct habitat loss of mule deer and pronghorn seasonal ranges; • Indirect habitat loss of mule deer and pronghorn seasonal ranges; • Disturbance and barrier impacts to migration routes; and • Increased human disturbance and poaching.
Bats	BLM Wyoming State Sensitive Species List (BLM 2010c)
	The majority of concerns identified during scoping associated with bats and potential wind turbine impacts include: • Implement mitigation to decrease the level of bat fatalities, particularly hoary bats; • Wind turbines should be sited 1 mile from woodland habitats to reduce impacts to bats; and • Turbines should be set to have a minimum cut-in speed of 6 meters per second to avoid increased mortality risk to bats during low wind speed nights.
Birds	• Migratory Bird Treaty Act (16 USC, § 703 et seq.); • Bald and Golden Eagle Protection Act; • Wyoming Statute (W.S. 23-1-101 and W.S. 23-3-108); and • BLM Wyoming State Sensitive Species List (BLM 2010c).
	The majority of concerns identified during scoping associated with birds and potential wind turbine impacts include: • Implement mitigation to decrease the level of avian fatalities, particularly passerines. Suggest different color turbines so that birds can see them; and • Turbines should be sited to minimize potential impacts to native passerines, particular BLM Sensitive Species such as the sage sparrow, Brewer's sparrow, and sage thrasher.
Fisheries	• Wildlife Habitat Management Plan for Red Rim and Grizzly WHMAs (BLM and WGFD 1994).
	The majority of concerns identified during scoping associated with fish and potential wind turbine impacts include: • Concern about aquatic species and impacts to fisheries from construction sediment runoff into nearby streams and rivers; and • Concern about creating fish barriers at new stream crossings.

The following criteria were considered in the assessment of potential impacts on wildlife associated with the alternatives and are the same as those contained in the Final EIS for the Rawlins RMP (BLM 2008b, Chapter 4, page 450). Impacts to wildlife or fisheries would be considered significant if any of the following was to occur:

1) Substantial loss of habitat function or disruption of life history requirements of a species or population segment that would make them eligible for listing under the ESA.
2) Decreased viability or increased mortality of threatened and endangered, proposed and candidate species, or reduction or alteration of their critical habitats.
3) Management actions that result in substantial disruption or irreplaceable loss of vital and high value habitats, as defined in the WGFD (2004b) Mitigation Policy.
4) Substantial loss of habitat function or disruption of life history requirements of special status species that would preclude improvement of their status.
5) Actions preclude attainment of conservation goals, as stated in conservation plans and strategies for special status species.

The analysis for wildlife and fisheries resources assumed the BLM would continue to manage fish and wildlife habitats in coordination with the WGFD. The USFWS would have jurisdiction over the management of threatened or endangered fish and wildlife populations. The BLM, in conjunction with WGFD would continue to manage species listed on the BLM Wyoming State Director's Sensitive Species List in accordance with BLM Manual 6840. Further assumptions are that the voluntary measures committed to by the applicant and the BMPs (**Appendix C, Tables C-2** and **C-3**) would be implemented under all alternatives.

Descriptions of analysis and additional assumptions were made for specific wildlife and fisheries resources. The resources and associated analysis methods and assumptions are provided below.

Big Game

Assumptions for the analysis included the following: 1) direct loss of habitat that occurs in seasonal ranges outside of those designated as crucial winter range (CWR) will not adversely affect big game; 2) indirect habitat loss (i.e., avoidance) of big game seasonal ranges will not extend beyond 0.62 mile of project infrastructure; 3) indirect habitat loss is a function of human activity and therefore is greater in the construction phase compared to operational phase; and 4) the potential for vehicle collisions, poaching, and other wildlife harassment will be directly related to the length of new permanent roads.

Bats

Total bat mortality was estimated using the mean number of bat collision fatalities/MW/year at 21 other modern wind energy facilities in western North America, which is 2.1/MW/year (Johnson and Stephens 2011). Fatality estimates based on mean number of bat fatalities/MW/year from studies of other wind energy facilities in western North America should be considered tentative, as no fatality data exist for the large 3.0-MW turbines proposed for the project. Nevertheless, we assume bat fatality rates for a 3.0-MW turbine would be approximately twice as high as a 1.5-MW turbine, primarily because the rotor-swept area of a 3.0-MW turbine with a 100-m rotor diameter is 7,850 meters^2, or approximately 1.7 times larger than the rotor diameter of a typical 1.5-MW wind turbine with a rotor diameter of 77 m, which is 4,654 meters^2. In addition, the hub height of a typical 3.0-MW turbine is up to 100 m, whereas the hub height of a typical 1.5-MW turbine ranges from 65 to 80 m. Based on an analysis of bat fatality data at wind farms with turbines ranging in size from 0.04 to 1.8 MW, tower heights ranging from 24 to 94 m and rotor diameters ranging from 15 to 80 m, Barclay et al. (2007) concluded that bat fatality rates increased exponentially with the tower height of wind turbines. Even though the mortality estimates for 3.0-MW turbines were made without having any existing fatality data from these turbines, they provide a

basis for comparing alternatives with regard to bat fatality impacts. For estimating impacts to bats through loss of habitat, we assumed that the largest potential impact would be loss of wetland/riparian and woodland habitat impacted by each alternative, as riparian areas and wetlands provide the most likely foraging habitat while woodlands provide roosting habitat in the Application Area. Because bats may forage in several land cover types, including shrublands and grasslands, we also assumed that the total acreage of temporary and permanent impacts associated with each alternative would be correlated with bat impacts.

Additional assumptions for the analysis include:

- Bat collision mortality would be similar at all 3.0-MW turbines used for the project; and
- Impacts to bats will be limited to collision mortality and direct loss of habitat; no displacement or other indirect impacts were assumed.

Birds

To predict raptor fatalities associated with each alternative, we assumed that the estimate of 0.04 raptor fatalities/MW/year based on preconstruction raptor use and the regression analysis described above is a reasonable estimate of raptor fatality. Because a similar relationship does not exist between preconstruction bird use estimates and all bird mortality, we estimated total bird mortality using the mean number of bird collision fatalities/MW/year at 21 other modern wind energy facilities in western North America, which is 1.8/MW/year (Johnson and Stephens 2011). Fatality estimates based on mean number of bird fatalities/MW/year from studies of other wind energy facilities in western North America should be considered tentative, as no fatality data exist for the large 3.0-MW turbines proposed for the project. These estimates assume raptor and all bird fatality rates for a 3.0-MW turbine would be twice as high as a 1.5-MW turbine, primarily because the rotor-swept area of a 3.0-MW turbine is nearly twice as large as a 1.5-MW turbine. Even though the mortality estimates for 3.0-MW turbines were made without having any existing fatality data from these turbines, they provide a basis for comparing alternatives with regard to bird fatality impacts. Sufficient data do not exist to predict with any accuracy how many raptor or other bird collision/electrocution fatalities could occur at new above-ground power lines. Therefore, to compare alternatives with regard to this impact, we assumed that direct mortality would be related to the length of new power lines proposed for each alternative. For assessing direct habitat loss, we assumed all vegetation types are used by birds, and estimated the total amount of initial and long-term disturbances to all vegetation types combined. To examine impacts on sagebrush obligate species (loggerhead shrike, sage thrasher, Brewer's sparrow, sage sparrow), we calculated the total amount of disturbance to all shrub-steppe habitats containing sagebrush in the Application Area.

To assess indirect impacts to nesting raptors, we compared the number of active raptor nests based on 2008-2009 survey data, as well as all raptor nests in the BLM database, within 1 mile of project infrastructure among the alternatives. For assessing indirect impacts to other breeding birds, we used an assumed maximum distance that displacement may occur of 200 m from turbines based on the available literature. To examine displacement of sagebrush obligate species, we calculated the amount of all shrub-steppe habitats containing sagebrush present within 200 m of turbines for each alternative. We further assumed that indirect impacts to birds would be related to the length of roads associated with each alternative.

Additional assumptions for the analysis include:

- Raptor and all bird collision mortality would be similar at all 3.0-MW turbines used for the project;
- For estimating impacts to birds through loss of habitat, we assumed that the total acreage of initial and long-term impacts associated with each alternative are correlated with bird impacts;

- For the purpose of assessing direct impact to sagebrush obligate species, initial disturbances were treated the same as long-term disturbances due to the length of time it could take before sagebrush is re-established to pre-disturbance levels on disturbed sites, which could be nearly as long as or as long as the life of the project (20 to 30 years); and
- Direct impacts related to vehicle collisions as well as indirect impacts associated with vehicle disturbance are directly related to the length of new permanent roads.

Small Game, Furbearers, Reptiles, and Amphibians

To assess the direct habitat loss for small game, furbearers, reptiles, amphibians, we assumed all vegetation types are used by small game, furbearers, reptiles, and amphibians, and estimated the total amount of initial and long-term disturbances to all vegetation types combined. To assess indirect impacts to reptiles and amphibians, a 100 m buffer was applied to both sides of the proposed roads for each alternative to determine total acreage impacted. Potential direct loss from vehicular collision was evaluated based on the length of roads associated with each alternative. The length of road also was used to evaluate the potential impacts from habitat fragmentation.

Additional assumptions for the analysis include:

- For estimating impacts to small game, furbearers, reptiles, and amphibians through loss of habitat, we assumed that the total acreage of temporary and permanent impacts associated with each alternative are correlated with small game, furbearers, reptiles, and amphibians impacts.
- Ecological indirect impacts on reptiles and amphibians from road construction extend beyond 100 m of a road edge.
- Direct impacts related to vehicle collisions as well as indirect impacts associated with vehicle disturbance were considered to be directly related to the length of new permanent road.
- Habitat fragmentation was considered to be directly related to the length of new permanent road.

Fisheries

Potential impacts to fish species were evaluated by: 1) reviewing the amount and location of water extraction for construction, 2) identifying the road density, and 3) stream crossings for each sub-watershed where trout streams or reservoirs are located for each alternative. It is anticipated that the project would require approximately 500 to 637 acre-feet of water over the four-year construction period. Currently, the exact location of water extraction has not been determined. The analysis relating to water extraction made the assumption that up to 10 percent (50 to 64 acre-feet) of water may be extracted from the Colorado River and up to 100 percent may be extracted from the North Platte River.

4.14.2 Impacts to Wildlife and Fisheries Resources from the No Action Alternative

Under the No Action Alternative, the proposed project would not be implemented at any scale and the Application Area would exist under current authorizations and land uses (e.g., livestock grazing). Therefore, no impacts to wildlife or fisheries resources associated with development of the project would occur.

4.14.3 Impacts to Wildlife and Fisheries Resources from Alternative 1R, Applicant Proposed Alternative

The Alternative 1R boundary encompasses a total of approximately 215,560 acres. The conceptual design for Alternative 1R would result in the potential disturbance of approximately 7,221 acres of initial disturbance and 1,544 acres of long-term disturbance. These acres represent 3 percent and 1 percent, respectively of the available wildlife habitat within the Alternative 1R boundary area. Road construction

associated with this alternative is estimated at 368 miles. Alternative 1R includes 10,417 acres of the Upper Muddy Creek Watershed/Grizzly WHMA and 1,285 acres of the Red Rim-Grizzly WHMA.

Potential impacts to terrestrial and aquatic wildlife resources under the Alternative 1R include the direct loss of habitat, indirect habitat loss due to behavioral avoidance and alterations of movement patterns, degradation of surface water habitats, and mortalities resulting from construction activities, wildlife-vehicle collisions and human interactions. The severity of these effects on wildlife species depend upon factors such as the sensitivity of the species, seasonal use patterns, type and timing of project activity and physical parameters (e.g., topography, cover, forage, climate). It is assumed that impacts associated with decommissioning of Alternative 1R would be similar to those caused during construction and the reclamation procedures would include spreading topsoil, and revegetating all disturbed areas. However, the decommissioning phase would have a reduced potential for inadvertent wildlife mortality through vehicle collision based on the predicted traffic levels for decommission presented in Section 4.10.5, Decommissioning and Final Reclamation.

4.14.3.1 Big Game

Potential impacts from Alternative 1R to big game include: direct habitat loss of seasonal ranges, behavioral avoidance or indirect habitat loss of seasonal ranges, disruption of migration routes, and increased levels of human disturbance that could lead to higher levels of vehicle collisions and poaching. The magnitude of these impacts depends upon the density and location of infrastructure relative to big game seasonal ranges, and the amount of human activity associated with the development. To date, the potential impacts of wind power development on big game are largely unknown. However, many studies have shown that big game species tend to avoid human disturbances such as roads (Cole et al. 1997; Rowland et al. 2000), bicyclists (Taylor and Knight 2003), hikers (Miller et al. 2001), and snowmobiles (Freddy et al. 1986; Seip et al. 2007). Additionally, studies of oil and gas development suggest that big game species avoid areas near infrastructure, creating indirect habitat loss that is considerably larger than the direct habitat loss (Sawyer et al. 2009a, 2006). Across multiple years, mule deer were less likely to use areas within 1.2 to 1.8 miles of well pads in winter ranges of western Wyoming (Sawyer et al. 2009a, 2006). Given the consistent ways in which animals respond to perceived risk (Frid and Dill 2002); it is reasonable to assume that wind power development will create indirect habitat losses for big game. However, because the footprint and level of human disturbance associated with wind power is typically lower than oil and gas development, we assume indirect habitat losses will not occur beyond a distance of 0.62 mile.

Although summer nutrition is key for big game reproduction and survival (Bishop et al. 2009; Cook et al. 2004; Parker et al. 2009), areas designated as CWR or parturition ranges are the only seasonal ranges considered by the WGFD to be limiting factors in maintaining big game populations, however no designated parturition ranges overlap with any of the alternatives. The WGFD describes CWR as a seasonal range that consistently receives high levels of use and is considered to be a limiting factor in maintaining population objective for a herd unit. Further, the WGFD recommends that habitat function of big game CWR be maintained so that the location, essential features, and species supported by the area are unchanged (WGFC 2010). The application of BLM seasonal restrictions to prevent construction activities on public lands within CWR between November 15 and April 30 may reduce the displacement of big game during winter, but does not eliminate it (e.g., Sawyer et al. 2006). Consistent with the Rawlins RMP, our analysis of direct and indirect habitat loss was restricted to big game CWRs that overlap with the Alternative 1R area.

The vast majority of big game animals that utilize the Alternative 1R area are migratory and sustaining populations at current levels will require that migration routes remain functional. Big game species show strong fidelity to their migration routes across years and seasons (Berger et al. 2006; Sawyer et al. 2009b), but the potential impacts of wind or other energy development on migration routes is unknown. Additionally, very few big game populations have been studied intensively enough to determine where

migration routes occur. Accordingly, we assume that the potential to impact big game migration is directly related to the number of turbines and length of new roads proposed in each alternative.

Mule Deer

The Alternative 1R boundary area overlaps with two mule deer herd units, including the Platte River (#541) and Baggs (#427) units and contains a total of 23,537 acres of CWR, 88,759 acres of winter-year-long range, and 102,573 acres of spring-summer-fall range. Because of the concentrated deer use in CWR, both direct and indirect habitat loss may reduce the overall carrying capacity of the CWR. Direct habitat loss of shrub communities, upon which mule deer rely, would be considered a long-term impact because of the length of time (20-30 years depending on the species) required for re-establishing shrubs to pre-development levels. Similar to oil and gas development (Sawyer et al. 2009a), indirect habitat loss during the operations phase is expected to be considerably lower than the construction phase. The ability of mule deer to acclimate to large-scale wind development is unknown. However, in a 7-year study in western Wyoming, Sawyer et al. (2009a) found no evidence of mule deer acclimating to natural gas development, but noted that avoidance was primarily related to traffic levels and could be reduced by limiting vehicle traffic.

Under the conceptual design associated with Alternative 1R, mule deer would experience the lowest level of direct (225 acres) and indirect habitat loss (19,875 acres) to CWR compared with the other action alternatives. As described above, CWR is considered to be the limiting factor for maintaining big game populations and management objectives, thus the potential CWR losses associated with Alternative 1R for mule deer may reduce the carrying capacity of CWR. In accordance with the BLM's environmental constraints (refer to **Appendix C**, **Table C-1**), surface disturbing and disruptive activities will not be allowed on public lands during the period of November 15 to April 30 in CWR. Additionally, disruptive activities will require the use of BMPs designed to reduce the amount of human presence and activity during the winter months.

Mule deer are known to migrate throughout the Alternative 1R boundary area. With the exception of the southwest portion of the Application Area (i.e., Miller Hill), the specific locations of migration routes are largely unknown. Migration routes of mule deer that winter in the Atlantic Rim Project area (BLM 2006) were recently documented (Sawyer et al. 2009b). Most of these deer migrate 20 to 40 miles northeast to their respective summer ranges. A portion of these deer migrate to and from Miller Hill. These deer migrate along the northwest edge of Miller Hill or through the two drainages (Grove Creek and McKinney Creek) and access the north and northeast slopes of Miller Hill. Mule deer can easily traverse dirt roads and maneuver around isolated development features, however the development threshold at which mule deer will no longer move through an area is unknown. Depending on the level of development on Miller Hill, it is possible that multiple turbine strings may have a barrier effect on mule deer migration routes. However, under Alternative 1R, the conceptual design for turbine strings would avoid the known migration routes, thus reducing the potential impact of disturbing mule deer movements through these routes.

New road construction increases the potential for inadvertent mortality through vehicle collision, poaching and general disturbance resulting from increased human activity. However, the ACM/BMP for Air-Dust Control (Appendix C-3) that requires speed limits to be posted on all access roads also would reduce the potential for vehicle-wildlife collisions. This alternative includes the construction of 368 miles of new roads within seasonal ranges for mule deer, which is the lowest amount among the action alternatives. Alternative 1R would have the lowest potential for inadvertent mortalities, poaching and general disturbance from human activities among the action alternatives.

The boundary for the Alternative 1R area would include 10,417 acres of the Upper Muddy Creek Watershed/Grizzly WHMA and 1,285 acres of the Red Rim-Grizzly WHMA. The portion of the Upper Muddy Creek Watershed/Grizzly WHMA within the Alternative 1R boundary does not contain any

CWR for mule deer, therefore the use of this area would not conflict with the management objective to maintain, restore and enhance mule deer CWR. Mule deer have been identified as a priority wildlife species of the Red Rim-Grizzly WHMA and are known to concentrate outside of the Alternative 1R boundary in the southwestern portion of the Red Rim-Grizzly WHMA during the winter months (BLM and WGFD 1994). Based on PCW's ACM to not site facilities within greater sage-grouse core breeding areas (**Appendix C**, **Table C-2**), only a small percentage (5.7 percent; or 3,421 acres) of the total upper Muddy Creek Watershed/Grizzly WHMA and (2.7 percent; or 1,038 acres) of the total Red Rim-Grizzly WHMA would potentially be impacted by construction of the project. It is not likely that the inclusion of this area would result in any indirect impacts to the mule deer beyond what has been described above. Nor would the inclusion jeopardize the stated management objectives of the either WHMA in regards to mule deer. If the final layout results in placement of infrastructure within the either WHMA, impacts to mule deer within the WHMAs would be the same as those described above.

The direct loss of CWR, combined with expansive areas of potential indirect impacts during construction and operation of the facility, would likely result in habitat loss and disturbance levels exceeding significance criteria 3.

Elk

The Alternative 1R boundary area overlaps with two elk herd units, including the Snowy Range (#533) and Sierra Madre (#425) units. Overall, 74 percent of the Alternative 1R boundary area is not classified as elk range. Of the 26 percent that is considered elk range, there is 129 acres of CWR, 1,044 acres of winter range, 33,462 acres of winter-year long range, and 20,863 acres of spring-summer-fall range. Direct or indirect loss of CWR habitat is unlikely to occur with the conceptual design for Alternative 1R; however elk may be displaced from portions of their yearlong or spring-summer-fall ranges. In accordance with the BLM's environmental constraints (**Appendix C**, **Table C-1**), surface disturbing and disruptive activities will not be allowed on public lands during the period of November 15 to April 30 in CWR. Additionally, disruptive activities will require the use of BMPs designed to reduce the amount of human presence and activity during the winter months.

Elk avoidance of roads is well-documented (Cole et al. 1997; Rowland et al. 2000) and tends to be exacerbated in areas without forest cover (Sawyer et al. 2007). New road construction increases the potential for wildlife-vehicle collisions, poaching and general disturbance resulting from increased human activity. However, as mentioned above, the ACM/BMP for Air-Dust Control (**Appendix C-3**) that requires speed limits to be posted on all access roads also would reduce the potential for vehicle-wildlife collisions. Under Alternative 1R approximately 36 miles of new road would be constructed within elk seasonal ranges. Alternative 1R would have the lowest potential for wildlife-vehicle collisions, poaching and general disturbance from human activities amount the action alternatives.

Elk are known to migrate throughout the Alternative 1R boundary area, but their migration routes are largely unknown. However, probable migration routes have been depicted on **Figure 3.14-2**. Placement of infrastructure under Alternative 1R would overlap with the eastern portion of the probable migration routes, thus, there is potential that Alternative 1R would interfere with elk movement between ranges. Based on the amount of infrastructure proposed in elk seasonal ranges among the action alternatives, Alternative 1R has the lowest potential for disrupting migration paths.

The boundary for the Alternative 1R area would include10,417 acres of the Upper Muddy Creek Watershed/Grizzly WHMA and 1,285 acres of the Red Rim-Grizzly WHMA. The portion of the Upper Muddy Creek Watershed/Grizzly WHMA within the Alternative 1R boundary does not contain any CWR for elk, therefore the use of this area would not conflict with the management objective to maintain, restore and enhance elk CWR. Similarly, elk have been identified as a priority wildlife species of the Red Rim-Grizzly WHMA and are known to occur within the WHMA year-round with CWR located outside of the Alternative 1R boundary in the southwestern portion of the WHMA (BLM and WGFD 1994). Based

on PCW's ACM to not site facilities within greater sage-grouse core breeding areas (**Appendix C**, **Table C-2**) only a small percentage (5.7 percent; or 3,421 acres) of the total upper Muddy Creek Watershed/Grizzly WHMA and (2.7 percent, or 1,038 acres) of the total Red Rim-Grizzly WHMA would potentially be impacted by construction of the project. It is not likely that the inclusion of this area would result in any indirect impacts to elk beyond what has been described above. Nor would the inclusion jeopardize the stated management objectives of either WHMA in regards to elk. If the final layout results in placement of infrastructure within the either WHMA, impacts to elk and elk CWR within the either WHMA would be the same as those described above.

Pronghorn

The Alternative 1R boundary area overlaps with four pronghorn herd units, including Iron Springs (Unit #630), South Ferris (#637), Baggs Herd Unit (#438) and Elk Mountain (#528) units. The Alternative 1R boundary contains 1,200 acres of CWR, 108,842 acres of spring-summer-fall range and 105,518 acres of winter-yearlong range. Reduction in the size or quality of the winter range may decrease the overall carrying capacity of the range. There are no published studies that document how pronghorn respond to wind or other energy development, but preliminary results from an ongoing study in western Wyoming suggest that pronghorn distribution may be less affected by development than mule deer (Beckman et al. 2008). The conceptual design for Alternative 1R would result in no direct habitat loss to pronghorn CWR and a low level of indirect habitat loss (343 acres) to pronghorn CWR. In accordance with the BLM's environmental constraints (refer to **Appendix C**, **Table C-1**), disruptive activities on public lands will require the use of BMPs designed to reduce the amount of human presence and activity during the winter months.

Pronghorn tend to increase vigilance and reduce their feeding time in areas with heavy traffic (>200 vehicles/week) (Berger et al. 1983). Gavin and Komers (2006) found that pronghorn response (i.e., vigilance and reduced feeding) to roads increased with traffic levels. New road construction increases the potential for wildlife-vehicle collisions, poaching and general disturbance resulting from increased human activity. However, as mentioned above, the ACM/BMP for Air-Dust Control (**Appendix C**, **Table C-3**) that requires speed limits to be posted on all access roads also would reduce the potential for vehicle-wildlife collisions. This alternative includes the construction of 368 miles of new roads within seasonal ranges for pronghorn, which is the lowest amount among the action alternatives. Alternative 1R would have the lowest potential for wildlife-vehicle collisions, poaching and general disturbance from human activities among the action alternatives.

Pronghorn are known to migrate throughout the Alternative 1R boundary area, but their migration routes are largely unknown. However, probable migration routes have been depicted on **Figure 3.14-3**. Fences that do not allow pronghorn to move underneath create movement barriers and can block migration routes. Accordingly, if fence construction is required, potential impacts to pronghorn migration may be reduced by constructing wildlife-friendly fences which allow pronghorns to move underneath. Alternative 1R proposed facility layout intersects both migration routes known to occur within the Chokecherry Area, however development around the known migration route to the east would be sparse. Based on the amount of infrastructure proposed in pronghorn seasonal ranges among the action alternatives, Alternative 1R has the lowest potential for disrupting pronghorn movement or migration.

The boundary for the Alterative 1R area would include 1,285 acres of the Red Rim-Grizzly WHMA. Pronghorn have been identified as a priority wildlife species of the Red Rim-Grizzly WHMA and are known to utilize sagebrush dominated and riparian areas of the WHMA during the summer and generally not found in the WHMA during the winter (BLM and WGFD 1994). Based on PCW's ACM to not site facilities within greater sage-grouse core breeding areas (**Appendix C**, **Table C-2**), impacts are anticipated to be minimal based on the small percentage (2.7 percent; or 1,038 acres) of the total Red Rim-Grizzly WHMA potentially impacted by construction of the project. It is not likely that the inclusion of this area would result in any indirect impacts to pronghorn beyond what has been described

above. Nor would the inclusion jeopardize the stated management objectives of the Red Rim-Grizzly WHMA in regards to pronghorn. If the final layout results in placement of infrastructure within the Red Rim-Grizzly WHMA, impacts to pronghorn within the WHMA would be the same as those described above.

4.14.3.2 Small Game and Furbearers

Potential impacts from Alternative 1R to small game and furbearers are similar to big game and include initial and long-term habitat loss, indirect habitat loss due to behavioral avoidance, and increased levels of human disturbance potentially resulting in wildlife-vehicle collisions and poaching. Similar to big game, the magnitude of these impacts depends upon the density and location of infrastructure and the amount of human activity associated with the development. The potential impacts of wind power development on small game and furbearers are largely unknown and population data for small game and furbearers is generally lacking.

Initial construction activities would result in a temporary loss of habitat, which through reclamation efforts and the lack of permanent structures should recover. Construction of permanent infrastructure, such as substations, roads, and turbines, would result in long-term habitat loss, thus reducing the availability of habitat. The loss of habitat may result in animals utilizing lower quality habitats, which may lead to the reduction in reproduction rates and increased predation. Some direct impacts to individuals may occur during construction due to wildlife vehicle collisions and destruction of burrows, dens, and nests. Indirect impacts including displacement, avoidance, and inter- and intra-species competition for resources are more difficult to quantify. Small game and furbearers are generally widespread species that utilize multiple habitats and have high reproduction rates (BLM 2006), therefore it is anticipated that potential direct mortalities associated with initial construction and indirect impacts would be minor.

The conceptual design for Alternative 1R would result in the initial loss of approximately 7,221 acres and the long-term loss of 1,544 acres of potential habitat. This would result in the loss of a relatively small percentage of the Application Area (3.2 percent and 0.7 percent, respectively) and the lowest among the alternatives.

New road construction increases the potential for inadvertent mortality through vehicle collision, poaching and general disturbance resulting from increased human activity (Trombulak and Frissell 2000). However as stated for big game, the ACM/BMP for Air-Dust Control (**Appendix C-3**) that requires speed limits to be posted on all access roads also would reduce the potential for vehicle-wildlife collisions. Alternative 1R includes the construction of 368 miles of new roads, which is the lowest amount among the action alternatives, thus Alternative 1R would have the lowest potential for wildlife-vehicle mortalities, poaching and general disturbance from human activities among the action alternatives.

The boundary for the Alternative 1R area would include 10,417 acres of the Upper Muddy Creek Watershed/Grizzly WHMA and 1,285 acres of the Red Rim-Grizzly WHMA. Management objectives of the Upper Muddy Creek Watershed/Grizzly WHMA do not specifically address small game and furbearers, thus the inclusion of the WHMA within Alternative 1R boundary would not result in any indirect impacts beyond what has been described. Small game and furbearers are considered in the Red Rim-Grizzly WHMA management goals by the general statement to ensure that native wildlife and vegetation communities are the primary benefactors of management decisions. Beavers are identified as a priority wildlife species of the Red Rim-Grizzly WHMA although the current beaver population or locations are not documented. Based on PCW's ACM to not site facilities within greater sage-grouse core breeding areas (**Appendix C**, **Table C-2**), impacts are anticipated to be minimal based on the small percentage (2.7 percent, or 1,038 acres) of the total Red Rim-Grizzly WHMA potentially impacted by construction of the project. It is not likely that the inclusion of this area would result in any indirect impacts to the small game and furbearers beyond what has been described above. Nor would the inclusion jeopardize the stated management objectives of the Red Rim-Grizzly WHMA in regards to

small game and furbearer species. If the final layout results in placement of infrastructure within the Red Rim-Grizzly WHMA, impacts to small game and furbearers within the Red Rim-Grizzly WHMA would be the same as those described above.

4.14.3.3 Nongame

Bats

Potential impacts from Alternative 1R to bats include direct impacts consisting of fatalities and loss of foraging and roosting habitat, as well as indirect impacts associated with habitat loss and modification The magnitude of these impacts depends upon the number of turbines constructed for each alternative and the amount of bat foraging and roosting habitat lost due to construction of the project.

Direct Impacts

Fatalities resulting from collisions with turbines are expected to be the primary impact on bats from Alternative 1R. Bat fatality estimates at 21 wind-energy facilities located throughout western North America have ranged from 0.07/MW/year at a facility in California to 12.4/MW/year over a 3-year period at a facility in Alberta, and averaged 2.1 fatalities/MW/year, which is slightly higher than mean avian mortality at those same wind energy facilities (Johnson and Stephens 2011). Although most bat fatalities at wind energy facilities have been assumed to be caused by blunt trauma from rotor contact, Baerwald et al. (2008) reported that 90 percent of bat fatalities necropsied at a facility in Alberta showed internal lung hemorrhaging consistent with barotrauma caused by rapid reduction in air pressure near moving turbine blades. Baerwald et al. (2008) hypothesized that direct contact with turbine blades may have accounted for only about half of the fatalities.

Among 2,285 bat fatalities reported from studies conducted in western North America, the hoary bat comprised 55.9 percent, silver-haired bat 33.1 percent, and Brazilian free-tailed bat (*Tadarida brasiliensis*) comprised 6.8 percent of the fatalities. Species each comprising <2 percent of the identified fatalities included little brown bat (*Myotis lucifugus*), big brown bat (*Eptesicus fuscus*), eastern red bat, western red bat (*Lasiurus blossevillii*), and evening bat (*Nycticeius humeralis*). Approximately 90 percent of bat fatalities occur from mid-July through the end of September, with over 50 percent occurring in August (Johnson 2005). At most sites, mortality during the spring migration and breeding season is much lower.

Bats are long-lived species with relatively low reproductive rates, so their populations are much slower to recover from large mortality events than more fecund species such as most bird species (Kunz et al. 2007a). Because migratory tree bats are primarily solitary tree dwellers that do not hibernate, no field methods are available to estimate their population sizes (Carter et al. 2003) and consequently it is impossible to evaluate turbine mortality from a population perspective. Although bat mortality at most wind-energy facilities in western North America is lower than in other portions of the U.S. (Arnett et al. 2008; Johnson 2005), the potential for significant population-level impacts in western North America cannot be determined without estimates of population sizes.

Some studies at wind-energy facilities have recorded both bat echo locations per night using acoustic detectors and bat mortality (**Table 4.14-3**). The number of bat passes per night as determined from bat acoustic detectors shows a rough correlation with bat mortality, but may be misleading because effort, timing of sampling, species recorded, and detector settings (equipment and locations) varied among studies (Kunz et al. 2007b). Nevertheless, the best available estimate of mortality levels at a proposed wind-energy facility involves evaluation of on-site bat acoustic data in terms of activity levels, seasonal variation, species composition, and topographic features of the proposed wind-energy facility.

Table 4.14-3 Wind-energy Facilities in the U.S. with Both Pre-construction Acoustic Sampling Data Using the Anabat Detector and Post-construction Mortality Data for Bats (adapted from Kunz et al. 2007b)

Wind-Energy Facility	Activity (#/detector night)	Mortality (bats/MW/year)	Reference
Chokecherry and Sierra Madre, Wyoming	4.3	--	WEST 2008j
Foote Creek Rim, Wyoming	2.2	1.3	Gruver 2002
Buffalo Ridge, Minnesota	2.1	2.2	Johnson et al. 2004
Buffalo Mountain, Tennessee	23.7	20.8	Fiedler 2004
Top of Iowa, Iowa	34.9	10.2	Koford et al. 2005
Mountaineer, West Virginia	38.3	38	Arnett et al. 2005

Bat activity within the Application Area (mean = 4.29 bat passes per detector-night) was somewhat higher than that observed at wind-energy facilities located in Minnesota (Johnson et al. 2004, 2003) and at Foote Creek Rim, also located in Carbon County, Wyoming, where bat mortality was low (Gruver 2002). However, bat activity was much lower than activity recorded at facilities in West Virginia (Arnett et al. 2005) and Tennessee (Fiedler 2004), where bat mortality rates were high. Thus, based on the presumed relationship between pre-construction bat activity and post-construction fatalities, bat mortality rates in the Application Area can be expected to be greater than the 1.3 bat fatalities/MW/year reported for Foote Creek Rim (Gruver 2002), but much lower than the 20.8 fatalities/MW/year reported at Buffalo Mountain, Tennessee (Fiedler 2004). Alternative 1R is assumed to be constructed using 1,000 3.0-MW wind turbines for analysis purposes.

Alternative 1R would potentially result in 6,300 bat fatalities per year using the average of 2.1 bat fatalities/MW/year at 21 wind energy facilities in western North America. Unlike with birds, where mortality would occur to numerous species throughout the year, bat mortality would likely be spread primarily among two species (hoary and silver-haired bats), and would be concentrated during one season (late summer/early fall). Because bats have slow reproductive rates and little is known about their population sizes, the loss of an estimated 6,300 individuals per year would be considered significant under significance criteria 4.

The Application Area is not located near any large, known bat colonies or features that are likely to attract large numbers of bats. Additionally, the Application Area does not contain topographic features that may funnel migrating bats, and is lacking large tracts of forest cover, unlike high-mortality wind-energy facilities in the eastern U.S. However, the relatively large numbers of bat fatalities recently reported in non-forested environments (croplands, grasslands) in northern Iowa (Jain 2005), Wisconsin (BHE Environmental, Inc. 2010; Gruver et al. 2009), and southwestern Alberta (Baerwald 2006) indicate that an open landscape is no guarantee of low mortality. Based on the relative scarcity of bat foraging and roosting habitat in the Application Area (e.g., wetlands and forested areas), the majority of bat fatalities are expected to be individuals migrating through the Application Area rather than local, breeding bats.

Of the 10 species of bats likely to occur in the Application Area, 4 are known to have been found as fatalities at wind-energy facilities, including big brown bat, hoary bat, little brown bat, and silver-haired bat. With the exception of hoary bat, bat species present in the Application Area were unable to be determined using the Anabat acoustic detectors. However, calls could be categorized as species emitting high or low-frequency calls. Sixty-three percent of passes were by high-frequency bats,

suggesting higher relative abundance of species such as mouse-eared bats (*Myotis* spp.) in the Application Area. These species generally show much lower mortality levels at existing wind-energy facilities in the U.S. (Arnett et al. 2005; Fiedler 2004; Gruver 2002; Johnson et al. 2004; Koford et al. 2005).

Alternative 1R, however, would potentially result in a loss of some available foraging and roosting habitat. Under the conceptual design for Alternative 1R there would be initial impacts to 75 acres and long-term impacts to 12 acres of riparian areas/wetlands that provide potential habitat for bat foraging and roosting. This alternative also would result in initial impacts to 121 acres of woodlands and steep, rocky areas, which is potential bat roosting habitat. For both riparian areas/wetlands and woodlands combined, this alternative would result in initial impact to 185 acres of bat foraging and roosting habitat.

The boundary for the Alternative 1R area includes 1,285 acres of the Red Rim-Grizzly WHMA. Bats are considered in management goals by the general statement to ensure that native wildlife and vegetation communities are the primary benefactors of management decisions. Based on PCW's ACM to not site facilities within greater sage-grouse core breeding areas (**Appendix C**, **Table C-2**), impacts are anticipated to be minimal based on the small percentage (2.7 percent; or 1,038 acres) of the total Red Rim-Grizzly WHMA potentially impacted by construction of the project. It is not likely that the inclusion of this area would result in indirect impacts to bats beyond what has been described above. Nor would the inclusion jeopardize stated management objectives of the Red Rim-Grizzly WHMA in regards to non-game species. If the final layout results in placement of infrastructure within the Red Rim-Grizzly WHMA, impacts would be the same as discussed above.

Sensitive Bat Species

Three species of bats potentially occurring in the area are considered sensitive species by the BLM Rawlins Field Office, including long-eared myotis, fringed myotis, and Townsend's big-eared bat. None of these three species are included among the 2,285 bat fatalities reported from 21 wind energy facilities in western North America (Johnson and Stephens 2011). The vast majority of bat fatalities at wind energy facilities are migratory tree bats, which include hoary and silver-haired bats in the western U.S. These two species comprised approximately 90 percent of bat fatalities in western North America, and bats in the genus *Myotis* represent only 1.7 percent of the 2,285 identified fatalities, all of which were little brown bats. At most wind facilities evaluated in the U.S., bat collision mortality during the breeding season was virtually non-existent, despite the fact that relatively large populations of resident bats of several species were documented breeding in close proximity to the wind facility (Arnett et al. 2007; Johnson 2005). Based on these studies, it appears that wind projects would pose little risk to non-migratory bat populations potentially occurring in the Application Area, including the long-eared myotis, fringed myotis, and Townsend's big-eared bat. In addition, a Biological Assessment prepared to address the potential for a wind facility in West Virginia to impact the federally endangered Virginia big-eared bat, a subspecies of Townsend's big-eared bat, concluded that the collision risk to this species is very low because it is non-migratory and forages well below the space occupied by turbine blades (Johnson and Strickland 2003). These conclusions also are likely applicable to Townsend's big-eared bat.

Alternative 1R would result in minor impacts to the sensitive bat species as they are non-migratory and it is anticipated that they forage in spaces below the turbine blades.

Indirect Impacts

No information is available to indicate that wind energy facilities displace bats. In fact, there is some information which suggests that bats may at least occasionally be attracted to turbines (Horn et al. 2008). However, construction and operation of wind energy facilities may indirectly impact bats through habitat loss and alteration. In forested situations, clearing trees for turbine placement is thought to increase foraging and commuting habitat for bats, but also may result in loss of roosting habitat (Arnett

et al. 2008). In non-forested areas, however, indirect impacts on bats are largely unknown. It is unlikely that noise generated by turbines influences roosting bats, but increased human activity at wind facilities could disturb roosting bats. However, there are no data to support or refute either one of these hypotheses (Arnett et al. 2008). Alteration of bat habitat may result from road construction and maintenance, buildings and structures associated with turbines, as well as power lines associated with wind-energy facilities; however, the influences of habitat characteristics on bats at large spatial scales are poorly understood (NAS 2008).

4.14.3.4 Birds

Potential impacts from Alternative 1R to birds include direct impacts consisting of fatalities and loss of habitat, as well as indirect impacts associated with habitat loss and modification and displacement of birds from project facilities. The magnitude of these impacts depends upon the number of turbines and other infrastructure constructed for each alternative and the amount of direct and indirect habitat lost due to construction and operation of the project.

The boundary for the Alternative 1R area would include 1,285 acres of the Red Rim-Grizzly WHMA. Bird species are considered in the Red Rim-Grizzly WHMA management goals by the general statement to ensure that native wildlife and vegetation communities are the primary benefactors of management decisions. Raptors are identified as a priority wildlife species within the Red Rim-Grizzly WHMA; with most known nests occurring in the southern portion of the WHMA outside of what would be included in the Alternative 1R boundary. Based on PCW's ACM to not site facilities within greater sage-grouse core breeding areas (**Appendix C**, **Table C-2**), impacts are anticipated to be minimal based on the small percentage (2.7 percent; or 1,038 acres) of the total Red Rim-Grizzly WHMA potentially impacted by construction of the project. Potential indirect impacts to birds within the Red Rim-Grizzly WHMA would be as described in the following analysis.

<u>Direct Impacts</u>

Fatality estimates for bird species are publicly available for 21 modern wind- energy facilities in western North America (Johnson and Stephens 2011). Bird fatality rates in the western North America have ranged from 0.1 to 4.4/MW/year, and averaged 1.8/MW/year, much lower than the U.S. national average (3.1/MW/year; NWCC 2004). Based on data from these 21 facilities, where 1,247 avian fatalities representing 128 species were reported, raptors comprised 19.4 percent of the identified fatalities. Passerines were the most common collision victims, comprising 59.3 percent of the fatalities. Upland game birds were the third most common group found, comprising 9.6 percent of bird fatalities. Doves and pigeons comprised 3.8 percent. Waterbirds were relatively uncommon, representing 4.0 percent of all fatalities. Waterfowl also were infrequently found (1.9 percent of all fatalities). Only three shorebirds (0.2 percent of all fatalities) were found. Other groups, such as nighthawks, woodpeckers, and swifts combined accounted for 1.9 percent of all fatalities. Birds that could not be identified to any avian group comprised 1.9 percent of reported fatalities (Johnson and Stephens 2011).

At 18 modern facilities in western North America where raptor fatality estimates are available, raptor fatalities rates have ranged from 0 to 1.8/MW/year, and averaged 0.2/MW/year (Johnson and Stephens 2011). The two facilities with the highest raptor fatality rates (1.8 and 0.5/MW/year) are in California. Of the 16 facilities located outside California, raptor fatality rates have ranged from 0 to 0.15, and averaged 0.07/MW/year, or approximately seven raptors for each 100 MW of development. These facilities include nine located in Washington and Oregon, three in Alberta, and one each in Montana, Wyoming, Nebraska, and Texas. Although raptor fatality rates are generally low at most modern wind-energy facilities, the number of fatalities relative to the number of individuals potentially exposed to collision is still much higher among raptors than among passerines (NAS 2008).

Although presence of bird mortality at turbines is well documented at many wind-energy facilities, population level effects have not been detected, but few studies have addressed this issue. Fatalities of passerines from turbine strikes generally are not significant at the population level, although exceptions to this could occur if facilities are sited in areas where migrating birds or rare species are concentrated (Arnett et al. 2007).

The most probable direct impact to birds from wind-energy facilities is direct mortality or injury due to collisions with turbines or guy wires of meteorological towers. Collisions may occur with resident birds foraging and flying within the Application Area or with migrant birds seasonally moving through the Application Area. Project construction could affect birds through loss of habitat, or potential fatalities from construction equipment. Impacts from the decommissioning of the facility are anticipated to be similar to construction in terms of noise, disturbance, and equipment. Potential mortality from construction equipment is expected to be very low. Equipment used in wind-energy facility construction generally moves at slow rates or is stationary for long periods (e.g., cranes). The risk of direct mortality to birds from construction is most likely the potential destruction of a nest of ground- and shrub-nesting species during initial site clearing. Direct impacts also may occur if nests are abandoned due to construction or operation of the facility.

Raptors

The annual mean raptor use within the Application Area (0.46 raptors/plot/20-minute survey), as determined though fixed-point bird use surveys, was compared with other wind-energy facilities that implemented similar protocols and had data for three or four seasons. Similar studies were conducted at 36 other wind-energy facilities. The annual mean raptor use at these wind-energy facilities ranged from 0.09 to 2.34 raptors/plot /20-minute survey. Based on the results from these wind-energy facilities, a ranking of seasonal raptor mean use was developed as: low (0 to 0.5 raptors/plot/20-minute survey); low to moderate (0.5 to 1.0); moderate (1.0 to 2.0); high (2.0 to 3.0); and very high (>3.0). Under this ranking, mean raptor use (number of raptors divided by the number of 800-m plots and the total number of surveys) in the Application Area is considered to be low, with the Application Area ranking twenty-second when compared with the 36 other wind-energy facilities.

An exposure index analysis may provide insight into what species have a higher likelihood of turbine casualties. The index considers relative probability of exposure based on abundance, proportion of daily activity spent flying, and proportion of flight height of each species within the zone of risk (ZOR) for turbines likely to be used at the wind-energy facility. For the Application Area, the raptor species with the highest exposure index was the golden eagle, which was ranked second of all species, at 0.06. The relatively higher exposure index for the golden eagle was due to flight height data showing that 45.0 percent of flying observations were within the ZOR based on initial observations. The exposure index analysis is based on observations of birds during the daylight period and does not take into consideration flight behavior (e.g., during foraging or courtship) or abundance of nocturnal migrants. It also does not take into consideration habitat selection by birds, the ability to detect and avoid turbines, and other factors that may vary among species and influence likelihood for turbine collision. For these reasons, the actual risk for some species may be lower or higher than indicated by this index. Based on species composition of the most common raptor fatalities at other western North America wind-energy facilities and species composition of raptors observed at the Application Area during the surveys, the majority of the fatalities of diurnal raptors will likely consist of red-tailed hawks, American kestrels, and golden eagles. Based on the seasonal use estimates, it is expected that risk to raptors would be unequal across seasons, with the lowest risk in the winter and the highest risk during the fall. However, the winter use estimates were only based on three surveys that were completed prior to the area becoming inaccessible due to snow. Therefore, winter use as based on these three surveys may not be representative of actual use throughout the entire winter, but is the best data available for predicting winter use of the Application Area by raptors.

Based on results of a regression analysis of raptor use and mortality for 13 new-generation wind-energy facilities, where similar methods were used to estimate raptor use and mortality, there was a significant correlation between use and mortality (R^2 = 69.9 percent; WEST unpublished data). Using this regression to predict raptor collision mortality at the Application Area, based on an adjusted mean raptor use of 0.46 raptors/plot/20-minute survey, yields an estimated fatality rate of 0.04 fatalities/MW/year. A 90 percent prediction interval around this estimate is zero to 0.30 fatalities/MW/year. This estimate is slightly lower than the average raptor fatality rate of 0.07 fatalities/MW/year at existing modern wind energy facilities in western North America.

Active raptor nest density was 0.07 nests/mile^2 within the Chokecherry area and associated 1-mile buffer surrounding the Application Area and 0.14 nests/mile^2 within the Sierra Madre area and associated 1-mile buffer surrounding the Application Area. This is low to moderate in comparison to 16 other wind facilities evaluated in the western U.S., where active raptor nest density ranged from 0.03 to 0.43 nests/mile^2 and averaged 0.22 nests/mile^2. The low active raptor nest density of the Application Area will minimize the potential impact of the proposed project to nesting raptors. Since few raptor species targeted during nest surveys have been observed as fatalities at newer wind-energy facilities, correlations are very low between the number of collision fatalities and raptor nest density within 1 mile of the wind-energy facility. Raptors nesting closest to turbines likely have higher probabilities of being impacted from collision with turbines, but existing data on nests very close to turbines (e.g., within 0.5 mile) are currently inadequate to determine the level of these impacts. The existing wind-energy facility with the highest reported nest density is the Foote Creek Rim wind-energy facility in Wyoming, which lies approximately 60 miles east of Rawlins. Most of the nests within 2 miles of the wind-energy facility are of red-tailed hawk (Johnson et al. 2000b), but no red-tailed hawk fatalities were documented at this site during post-construction studies (Young et al. 2003a,b).

Using the predicted raptor fatality rate of 0.04 fatalities/MW/year indicates that 120 raptor fatalities could occur per year under Alternative 1R. These fatalities would be spread over several species, seasons, and between resident, migrant and wintering birds. The conceptual design for Alternative 1R has 179 miles of new aboveground power lines. Alternative 1R has 14 active raptor nests located within 1 mile of turbines based on 2008-2009 surveys. Using the BLM database of all raptor nests documented in the area since 1980, which may be an indicator of the suitability of raptor nesting habitat, 559 raptor nest locations are present within 1 mile of turbines.

Eagles

Baseline avian studies conducted for the project indicate extremely low use of the Application Area by bald eagles; as such no significant impacts to this species are anticipated. Golden eagles had the highest use of the Application Area of any raptor species, comprising 30.4 percent of all raptor use. Mean use of the Application Area by golden eagles (0.14/plot/20-minute survey) was moderate compared to 24 other wind resource areas evaluated in the western U.S., where golden eagle use has ranged from 0 to 0.49/plot/20-minute survey, and averaged 0.11/plot/20-minute survey (**Table 4.14-4**). Assuming that species composition of raptor mortalities would be related to species abundance during the baseline surveys, and given that the total estimated number of raptor fatalities for Alternative 1R is 120, than approximately 36 golden eagle fatalities could occur on an annual basis.

Migratory Birds

Most bird species in the U.S. are protected by the MBTA. Passerines (primarily small perching and songbirds) have been the most common bird fatality at wind energy facilities outside California (Erickson et al. 2002a,b, 2001; Johnson and Stephens 2011), often comprising more than 80 percent of the bird fatalities. Both migrant and resident passerine fatalities have been observed. Given that passerines made up a large proportion of the birds observed during the baseline study, passerines

Table 4.14-4 Golden Eagle Use Estimates Standardized to Number of Golden Eagles Observed/800-M Plot/20-Minute Period

Project Name and State	Average[3] Overall Use[†]	Reference
Glenrock, Wyoming	0.49	Johnson et al. 2008a
Dunlap, Wyoming	0.28	Johnson et al. 2009a
Foote Creek Rim, Wyoming[2]	0.27	Johnson et al. 2000b
Elkhorn Valley, Oregon	0.26	WEST 2005a
Seven Mile Hill, Wyoming	0.26	Johnson et al. 2008b
High Winds, California[1]	0.20	Kerlinger et al. 2005
Diablo Winds, California[1]	0.20	WEST 2006
Chokecherry/Sierra Madre, Wyoming	0.14	WEST 2009b
Morton Pass Reference, Wyoming[2]	0.12	Johnson et al. 2000b
Antelope Ridge, Oregon	0.11	Enk et al. 2010
Simpson Ridge, Wyoming[2]	0.10	Johnson et al. 2000b
Wild Horse, Washington[1]	0.06	Erickson et al. 2003a
High Plains, Wyoming	0.05	Johnson et al. 2009c
Leaning Juniper, Oregon	0.04	NWC and WEST 2005
Swauk Ridge, Washington	0.03	Erickson et al. 2003b
Windy Point, Washington	0.02	Johnson et al. 2006
Maiden, Washington[1]	0.02	Young et al. 2002
Windy Flats, Washington	0.02	Johnson et al. 2007
Hopkins Ridge, Washington[1]	0.02	Young et al. 2003a
Golden Hills, Washington[1,3]	0.02	Jeffrey et al. 2008
White Creek, Washington	0.01	Johnson et al. 2003
Sunshine, Arizona[1]	0.01	WEST and CPRS 2006
Klondike, Oregon[1]	0.01	Johnson et al. 2002
Biglow, Oregon	0	WEST 2005b
Mean	0.11	

[1] Adjusted from 30-minute surveys.

[2] Adjusted from 40-minute surveys.

[3] Non-weighted averages of seasonal use estimates.

[†] Average overall use adjusted to the number of golden eagles/20-minute survey.

would be expected to make up the largest proportion of fatalities in the Application Area. Exposure indices indicate that the horned lark is the passerine most likely to be exposed to collision from wind turbines in the Application Area. Most non-raptors had relatively low exposure indices due to the majority of individuals flying below the likely ZOR. Unlike with raptors, there appears to be little correlation between avian use for passerines and turbine caused mortality, perhaps because many of the passerine fatalities at wind turbine are nocturnal migrants that diurnal surveys do not account for. However, assuming that mortality of non-raptors would be within the range of that at other wind energy facilities in western North America (averaging 1.8/MW/year), approximately 5,400 fatalities could occur on an annual basis with 3,000 MW of wind energy production associated with Alternative 1R. These fatalities are spread across numerous species and bird groups, as well as across seasons. Therefore, the overall impact to any given species or population of a species is substantially less. Therefore, it is unlikely that migratory bird populations (e.g., passerines, waterfowl, waterbirds, doves) will be significantly impacted by direct mortality from operation of the wind-energy facility.

Sensitive and Sagebrush Obligate Species

No federally-listed threatened or endangered species were observed in the Application Area point bird use surveys or incidentally. Thirty-five groups totaling 151 greater sage-grouse were observed. Impacts to greater sage-grouse are discussed in Section 4.15, Impacts to Special Status Species. Other BLM sensitive species documented in the Application Area during surveys included ferruginous hawk, burrowing owl, loggerhead shrike, sage thrasher, Brewer's sparrow, and sage sparrow. The most frequently observed sensitive bird species were Brewer's sparrow (80 individuals), sage thrasher (65), and sage sparrow (59); these also were among the most common passerine species recorded in the Application Area. In addition, four loggerhead shrikes were observed during point count surveys. Brewer's sparrows, sage thrashers, sage sparrows and loggerhead shrikes are all considered sagebrush obligate species. However, none of these species were observed flying within the ZOR. Therefore, significant risk of collision mortality is not expected for these species. Only five ferruginous hawks were recorded during avian point count surveys, with another eight individuals recorded incidentally. One burrowing owl was recorded incidentally (i.e., not as a part of avian use surveys). Use of the Application Area by these two species was relatively low and significant impacts are not anticipated, although some individual fatalities may occur over the life of the project.

Indirect Impacts

In addition to direct impacts through collision mortality, wind-energy development results in the direct loss of habitat where infrastructure is placed and indirect loss of habitat through behavioral avoidance and habitat fragmentation for some species. Direct loss of habitat associated with wind-energy development is relatively minor compared to most other forms of energy development. Although wind-energy facilities can cover substantial areas, the permanent footprint of facilities such as the turbines, access roads, maintenance buildings, substations and overhead transmission lines, generally occupies only 5 to 10 percent of the entire development area (BLM 2005b). The POD for the project estimates that temporary impacts will average 1.5 acres per turbine, while long-term impacts will average 0.25 acre per turbine (PCW 2009a). Under Alternative 1R with the conceptual design initial disturbance would be 3.3 percent of the alternative area, with long-term disturbance of 0.7 percent. Behavioral avoidance, however, may reduce habitat suitability over much larger areas for some species of wildlife, depending on how far a species is displaced from wind-energy facilities. Based on some studies in Europe, displacement impacts may have a greater impact on birds than collision mortality (Gill et al. 1996). The greatest concern with displacement impacts has been where facilities were constructed in native habitats such as grasslands or shrublands (Leddy et al. 1999; Mabey and Paul 2007).

Raptors

Most studies on raptors at existing wind-energy facilities indicate displacement impacts to be negligible. A before-after/control impact study of avian use at the Buffalo Ridge wind-energy facility in Minnesota found evidence that northern harriers (*Circus cyaneus*) avoid turbines on small scale (328 feet [<100 m] from turbines) and large scales (range of 345 to 17,598 feet [105 to 5,364 m]) in the year following construction (Johnson et al. 2000a). Two years following construction, however, no large-scale displacement was detected. The only published report of avoidance of wind turbines by nesting raptors occurred at the Buffalo Ridge facility, where raptor nest density on 101 mile^2 (261.6 square kilometers [km^2]) of land surrounding the facility was 5.94 nests/39 mile^2 (5.94 nests/101.0 km^2) yet no nests were present in the 12 mile^2 (31.1 km^2) facility itself, even though habitat was similar (Usgaard et al. 1997). At a facility in eastern Washington, raptors still nested in the study area at approximately the same levels after construction, and several nests were located within a 0.5 mile of turbines (Erickson et al. 2004). Similar numbers of raptor nests before and after construction of Phase 1 of the Montezuma Hills facility in California, and anecdotal evidence indicates that raptor use of the Altamont Pass Wind Resource Area in California may have increased since installation of wind turbines (Orloff and Flannery 1992). At the Foote Creek Rim wind-energy facility in southern Wyoming, one pair of red-tailed hawks nested within 0.3 mile of the nearest turbine, and seven red-tailed hawk nests, one great horned owl (*Bubo virginianus*) nest, and one golden eagle nest located within 1 mile of the facility successfully fledged young (Johnson et al. 2000b; WEST, unpublished data). The golden eagle pair successfully nested 0.5 mile from the facility for three different years after the project became operational.

Migratory Birds

Studies in the western U.S. concerning displacement of non-raptor species have concentrated on grassland passerines and waterfowl. Wind-energy facility construction appears to cause small-scale local displacement of some grassland passerines and is likely due to the birds avoiding turbine noise and maintenance activities. Construction also reduces habitat effectiveness because of the presence of access roads and large gravel pads surrounding turbines (Johnson et al. 2000a; Leddy 1996). Leddy et al. (1999) surveyed bird densities in Conservation Reserve Program (CRP) grasslands at the Buffalo Ridge wind-energy facility in Minnesota, and found mean densities of 10 grassland bird species were four times higher at areas >591 feet from turbines than they were at grasslands nearer turbines. Johnson et al. (2000a) found reduced use of habitat within 328 feet of turbines by 7 of 22 grassland-breeding birds following construction of the Buffalo Ridge facility. At the Stateline wind-energy facility in Oregon and Washington, use of areas <164 feet from turbines by grasshopper sparrows (*Ammodramus savannarum*) was reduced by approximately 60 percent, with no reduction in use >164 feet from turbines (Erickson et al. 2004). At the Combine Hills facility in Oregon, use of areas within 492 feet of turbines by western meadowlarks was reduced by 86 percent, compared to a 12.6 percent reduction in use of reference areas over the same time period (Young et al. 2006). Horned larks, however, showed significant increases in use of areas near turbines at both of these facilities, possibly because the cleared turbine pads and access roads provided habitat preferred by this species. Shaffer and Johnson (2008) examined displacement of grassland birds at two wind energy facilities in the northern Great Plains. Intensive transect surveys were conducted on plots with and without turbines. The study focused on five species at two study sites, one in South Dakota and one in North Dakota. Based on this analysis, killdeer (*Charadrius vociferous*), western meadowlark, and chestnut-collared longspur (*Calcarius ornatus*) showed no avoidance of wind turbines. However, grasshopper sparrow and clay-colored sparrow (*Spizella pallida*) showed avoidance out to 656 feet.

At the Buffalo Ridge facility, the abundance of several bird types including shorebirds and waterfowl was significantly lower at survey plots with turbines than at reference plots without turbines, indicating that the area of reduced use was limited primarily to areas within 328 feet of the turbines (Johnson et al. 2000a). These results are similar to those of Osborn et al. (1998), who reported that birds at Buffalo Ridge avoided flying in areas with turbines.

Populations of mountain plovers (*Charadrius montanus*) at the Foote Creek Rim wind-energy facility in Wyoming declined during construction but have slowly increased since, although not to the same level present prior to construction. It is not known if the initial decline or subsequent increase was due to presence of the wind-energy facility or to regional changes in mountain plover populations, as similar declines at a reference area occurred during the study. Nevertheless, some mountain plovers have apparently become habituated to the turbines, as 11 of 28 nests found during surveys (39 percent) were located within 246 feet of turbines (Young et al. 2008).

The conceptual design for Alternative 1R would result in initial and long-term impacts to 7,221 acres and 1,544 acres, respectively, of all vegetation types combined. This alternative would result in combined initial and long-term disturbance to 7,121 acres of sagebrush or other shrub-steppe communities containing sagebrush. The Alternative 1R conceptual design also has 368 miles of new road construction. The conceptual design for Alternative 1R has 27,076 acres within 656 feet of all turbines, of which 24,254 acres are sagebrush or shrub-steppe communities with a sagebrush component. These acreages represent 12.6 percent and 11.3 percent of the Alternative 1R boundary area, respectively.

The estimated number of raptor fatalities, as well as the estimated proportion of the Alternative 1R boundary area with reduced use by passerines would exceed the significance criteria (criteria numbers 3 and 4).

4.14.3.5 Reptiles and Amphibians

Potential impacts from wind energy development on Wyoming's reptiles and amphibians are generally unknown (WGFD 2010). However, potential impacts include the direct loss of habitat, indirect habitat loss due to behavioral avoidance and alterations of movement patterns, degradation of surface water habitats, and mortalities resulting from construction activities, wildlife-vehicle collisions and human interactions. The magnitude of these impacts depends upon the density and location of infrastructure and the amount of human activity associated with the development.

Reptiles and amphibians have unique life histories, thus they have varying responses to habitat alterations (Hampton et al. 2010), which make it difficult to assess these species. However, the loss of potential habitat would be applicable to all species and possibly result in reduced reptile and amphibian diversity and abundance in the future (Hampton et al. 2010). The conceptual design for Alternative 1R would result in the initial loss of approximately 7,221 acres and the long-term loss of 1,544 acres of potential habitat for reptiles and amphibians. This would result in the loss of a relatively small percentage of the total Alternative 1R boundary area (3.3 percent and 0.7 percent, respectively) and the lowest among the alternatives.

Alternative 1R conceptual design includes the construction of 368 miles of new roads, thus increasing potential impacts such as wildlife-vehicle collisions, poaching, disrupting migrations paths, and general disturbance from increased human activity. Based on a literature review conducted by Jochimsen et al. (2004), the adverse ecological impacts of roads and traffic on amphibians and reptiles is estimated to extend outward from the road edge beyond 328 feet. This literature review documented that altered roadside habitats have been shown to modify amphibian and reptile behavior and movement patterns. Additionally increased mortality and barriers to movement from road construction may influence species demography and gene flow, potentially having an impact on overall population stability and persistence (Jochimsen et al. 2004). The combined indirect ecological impacts of road construction under the conceptual design for Alternative 1R on reptiles and amphibians were calculated to be an estimated 28,181 acres based on 328 feet beyond the road edge on either side. This calculation assumes that herpetofauna are uniformly distributed, which is unlikely. However, because population information is lacking for herpetofauna in the area, this was the determined to at least provide some level of estimation. This acreage represents approximately 13 percent of the Alternative 1R boundary area.

Amphibians are highly dependent upon water to complete their lifecycle (aquatic tadpole or larval phase). The loss or degradation of surface water during the larval period could negatively affect amphibian populations (WGFD 2010). Increased erosion and runoff would potentially change the surface water quantity and quality. The analysis conducted for surface water in Section 4.13, Impacts to Water Resources, assumed that the surface disturbance within a given watershed serves as an indicator of the potential for increased sediment and salt runoff. The conceptual design for Alternative 1R would result in the total surface disturbance within sub-watersheds ranging from 0.1 to 6.4 percent during construction and 0.1 to 1.1 percent during operations. Section 4.13, Impacts to Water Resources, identifies with the implementation of erosion control methods, application of BMPs, and the ACMs, would minimize impacts of land disturbance on surface water quantity and quality. Degradation of amphibian habitats by potential spills of hazardous materials from construction equipment is not anticipated based on the establishment of the project's SPCC Plan. The number of stream crossings from the construction of new roads would directly affect amphibian habitat. The conceptual design for Alternative 1R would result in 382 ephemeral stream crossings and four perennial stream crossing, which is the least for any action alternative. Direct impacts to wetlands, which would reduce potential amphibian habitat, have been estimated along 18,421 linear feet of wetland and riparian zone drainages under Alternative 1R (see Section 4.11, Vegetation). PCW has committed to BMPs and conservation measures (**Appendix C**, **Table C-2**) that would avoid, minimize, or mitigate wetland impacts. Furthermore, the Rawlins RMP requires that surface disturbing activities avoid the following areas: the identified 100-year floodplains, 500 feet from perennial surface water and/or wetland and riparian areas, and 100 feet from ephemeral channels (BLM 2008a). The avoidance of these areas would reduce the potential impacts on reptiles and amphibians. Exceptions to the avoidance would be granted by the BLM based on an environmental analysis and site-specific engineering and mitigation plans, but would only be granted if the areas cannot be avoided and protection for the aquatic resources would be ensured.

Direct mortality during construction may be expected with common slow-moving reptiles. Construction of turbine pads, roads, or other facilities could kill individuals in underground burrows or rock refuges or hibernacula. While above ground; snakes are likely mobile enough to be less vulnerable to construction equipment. Quantifying these changes is not possible because population data are lacking. However, the impact is likely to be minor, and the high reproductive potential of these species would enable populations to quickly occupy the area following successful reclamation. Amphibians may be more vulnerable to vehicle mortalities because their life histories often involve migration between wetlands and upland habitats, and individuals are inconspicuous and sometimes slow-moving (Trombulak and Frissell 2000).

Potential impacts to reptiles and amphibians during the operational phase of the project would be associated with the presence of the infrastructure, avoidance from increased human activity, and potential inadvertent mortalities. Inadvertent mortalities are likely to be minor and displacement of some of the local population would be likely, however, it is not anticipated to result in a significant impact.

The boundary for the Alternative 1R area would include 10,417 acres of the Upper Muddy Creek Watershed/Grizzly WHMA and 1,285 acres of the Red Rim-Grizzly WHMA. Reptiles and amphibians are considered in the Red Rim-Grizzly WHMA management goals by the general statement to ensure that native wildlife and vegetation communities are the primary benefactors of management decisions. Based on PCW's ACM to not site facilities within greater sage-grouse core breeding areas (**Appendix C**, **Table C-2**), only a small percentage (5.7 percent; or 3,421 acres) of the total Upper Muddy Creek Watershed/Grizzly WHMA and (2.7 percent, or 1,038 acres) of the total Red Rim-Grizzly WHMA would potentially be impacted by construction of the project. It is not likely that the inclusion of this area would result in any indirect impacts to the reptiles or amphibians beyond what has been described above. Nor would the inclusion would jeopardize the stated management objectives of the either WHMA in regards to reptiles or amphibians. If the final layout results in placement of infrastructure within either WHMA, impacts to reptiles and amphibians within either WHMA would be the same as those described above.

4.14.3.6 Fisheries

Potential impacts to fish habitat from Alternative 1R include: reduction in surface flow due to water extraction for dust control and construction; degradation of habitat due to increased sedimentation and salt runoff; alteration of hydrologic conditions from new road construction that could lead to sedimentation, erosion, and channel adjustments resulting in a loss of deep pool habitats; and construction of new stream crossings which could result in fragmentation of aquatic habitats and limit access to required habitats or block fish migration. The magnitude of these impacts will depend upon the amount and location of water extraction, the density of road construction within watersheds, the number of stream crossings, and the design of the stream crossings.

The boundary for Alternative 1R includes sub-watersheds that are part of the North Platte Basin, with the exception of McKinney Creek sub-watershed which is part of the White-Yampa Basin of the Colorado River drainage. The sub-watersheds within the Alternative 1R boundary contain important trout fisheries, a portion of the Upper Muddy Creek Watershed/Grizzly WHMA, and part of the Red Rim-Grizzly WHMA. Also, the Upper Muddy Creek, which extends into McKinney Creek sub-watershed basin, is delineated by the WGFD as a *priority habitat* in accordance with the Strategic Habitat Plan (WGFD 2009b). The trout fisheries consist of three creeks considered locally important (Middlewood, Grove, and Stoney), two creeks considered regionally important (Sage and McKinney), and Rawlins Reservoir. These fisheries are located within the North Platte River-Coal Mine Draw, Upper Sage Creek-North Platte River, and McKinney Creek sub-watersheds. The McKinney Creek sub-watershed under Alternative 1R includes 10,417 acres of the Upper Muddy Creek Watershed/Grizzly WHMA which is managed to maintain, restore, and enhance habitat for the Colorado River fish species unique to the Muddy Creek watershed (BLM 2008a) and 1,285 acres of the Red-Rim-Grizzly WHMA that is managed to improve stream and riparian habitat for Colorado River cutthroat trout reintroductions (**Figure 4.14-1**).

As explained in Section 4.13.2, Impacts to Water Resources from Alternative 1R, Applicant Proposed Alternative, for this analysis it is assumed that up to 500 acre-feet of water will be required during the 4-year construction of the proposed project, with the greatest use (285 acre-feet) occurring during the first year. It is possible that all of the water might come from the North Platte River watershed; however, it is possible that up to 50 acre-feet of the water required for construction would be extracted from the Colorado River watershed (PCW 2010a) with the greatest use (29 acre-feet) occurring during the first year. Under Alternative 1R, it was determined in Section 4.13.2, Impacts to Water Resources from Alternative 1R, Applicant Proposed Alternative, that the maximum extraction during the construction phase would occur during the first year and equate to approximately 0.04 percent of the North Platte River’s average annual flow near Sinclair and approximately 0.22 percent of the average annual flow of Muddy Creek near Baggs, Wyoming, or 0.04 percent of Savery Creek's average annual flow near Savery, Wyoming. This level of depletion would have a major impact to the local fishery and could potentially alter survival of fish in the system through changes such as water temperature, in-stream habitat, and sediment dynamics. This type of impact does not coincide with the management goals for the Upper Muddy Creek Watershed/Grizzly WHMA and Red Rim-Grizzly WHMA for fish and would potentially contribute to the decline of populations. This also may preclude the recovery of BLM sensitive fish species. The level of impact also would depend on the water year. Depletions from the North Platte River would not be allowed to impact current users or interstate agreements through the water rights processes required by the WSEO. At this time the exact locations for water extraction have not been identified, but prior to the Final EIS this information will be determined and additional analysis for potential impacts to fisheries will be conducted.

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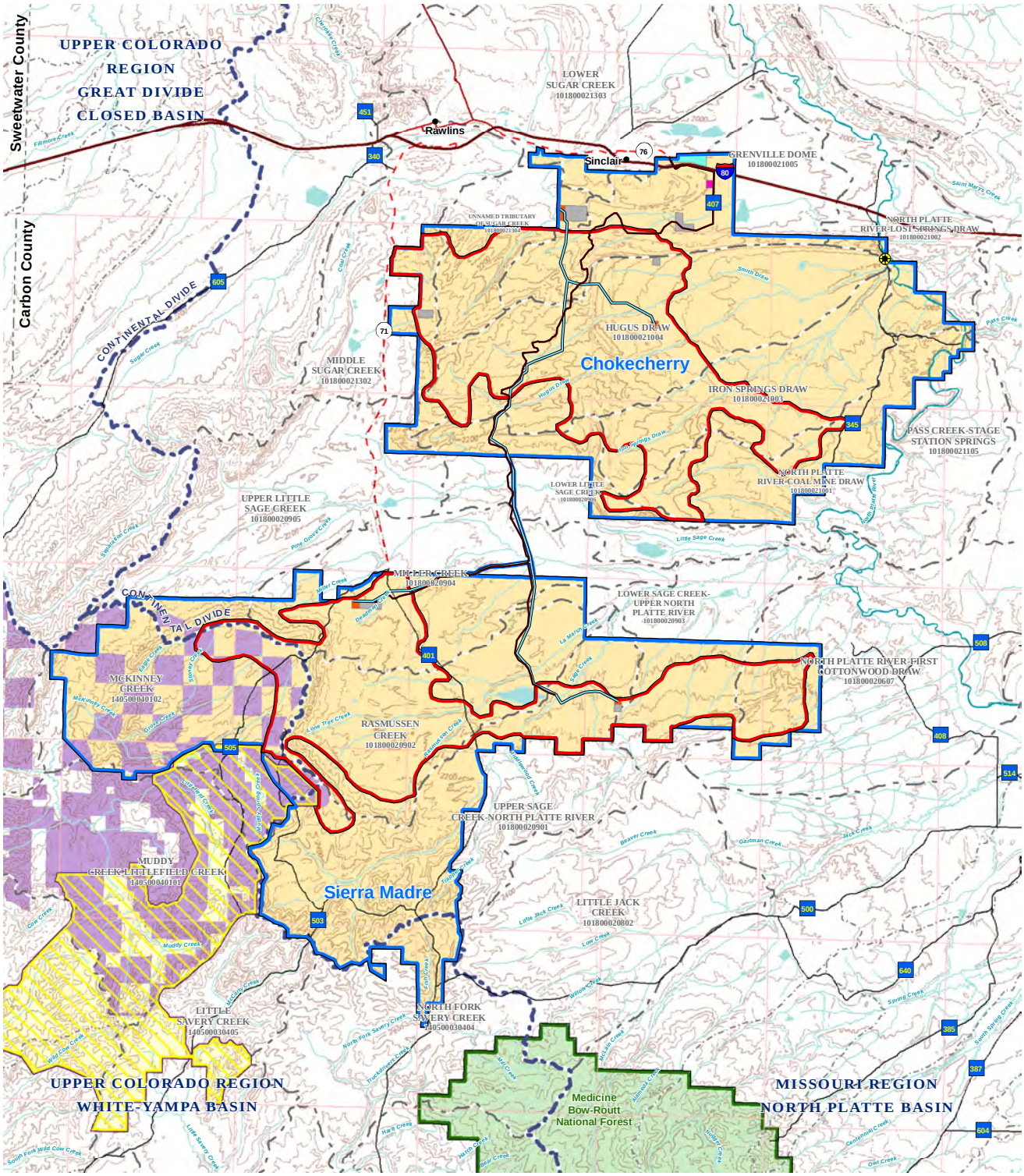

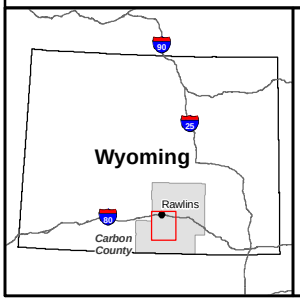

Legend

- Project Area
- Likely Area of Turbine Construction

Project Facilities

- Water Extraction Site
- Alternate O&M Facility
- Intermodal Rail Facility
- Staging Area (Construction Only)
- Substation
- Transmission Line
- Haul Road
- Continental Divide
- River or Creek
- Lake or Reservoir
- Hydrologic Basin
- Upper Muddy Creek/ Grizzly Wildlife Habitat Management Area
- Red Rim - Grizzly Wildlife Habitat Management Area

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.14-1

Impacts to the Upper Muddy Creek/ Grizzly Wildlife Habitat Management Area (WHMA) from Alternative 1R

0 1 2 3 4 5 Miles
0 1 2 3 4 5 10 Kilometers
1:320,000
N

The impact of new roads and construction of other facilities has been demonstrated to increase sedimentation that can have a variety of ecological impacts for fish habitat, including shifting habitat structure such as channel depth, pool-to-riffle ratio, percent fines in substrates, and cover availability (Angermeier et al. 2004). Sediment can extend miles downstream of the construction site and persist in stream channels for years (Angermeier et al. 2004). The surface water analysis conducted in Section 4.13, Impacts to Water Resources, assumed that the surface disturbance within a given watershed serves as an indicator of the potential for increased sediment and salt runoff. Under Alternative 1R the total surface disturbance within the sub-watersheds ranged from less than 0.1 percent to 6.4 percent during construction and from less than 0.1 percent to 1.1 percent disturbance during operation. The total surface disturbance in the North Platte River-Coal Mine Draw sub-watershed, which contains a statewide important fishery, would be 0.6 percent during construction and 0.1 percent during operations. The total surface disturbance in the Upper Sage Creek-North Platte River sub-watershed, which contains three of the noted fisheries, would be 1.1 percent during construction and 0.2 percent during operations. Total surface disturbance in the McKinney Creek sub-watershed, which contains three noted trout fisheries as well as the portions of the Upper Muddy Creek Watershed/Grizzly WHMA and Red Rim-Grizzly WHMA, would be 1.4 percent during construction and 0.3 percent during operations. Although these appear to be small percentages the location and proximity to streams is an important consideration. Based on the current conceptual layout for Alternative 1R, project development will generally be concentrated in higher-altitude upland areas away from the streams with the exception of road crossings. Section 4.13, Impacts to Water Resources, concludes with the implementation of erosion control methods, application of BMPs, and the ACMs, would minimize impacts of land disturbance on surface water quantity and quality. The management actions associated with the Rawlins RMP and the Upper Muddy Creek Watershed/Grizzly WHMA require that floodplains, riparian areas and wetlands be avoided (BLM 2008a). Exceptions to the avoidance would be granted by the BLM based on an environmental analysis and site-specific engineering and mitigation plans, but would only be granted if the areas cannot be avoided and protection for the aquatic resources would be ensured.

Degradation of fisheries habitats by potential spills of hazardous materials from construction equipment is not anticipated based on the establishment of the project's SPCC Plan. The use of magnesium chloride for dust abatement would potentially result in an increase in salinity of slow moving surface water or pond. However, a study conducted by Colorado Department of Transportation and University of Colorado concluded that the application of magnesium chloride as a deicer is highly unlikely to cause or contribute to environmental damage at distances greater than 20 yards from the roadway (American Association of State Highway and Transportation Officials 2009). Furthermore, as described in Section 4.13.2, Impacts to Water Resources from Alternative 1R, Applicant Proposed Alternative, storm water management including a surface water quality monitoring program would be implemented during active construction until reclamation is achieved.

Alternative 1R includes the construction of 368 miles of new roads, thus increasing potential impacts from road construction associated with the interception of shallow groundwater flow paths by roads. Road construction typically results in water frequently diverted along the roadway and routed to surface water drainage networks at drainage crossings. This can, in turn, alter the timing, routing, and magnitude of runoff, triggering geomorphic adjustments altering the current fish habitat. As stated in Section 4.13.2, Impacts to Water Resources from Alternative 1R, Applicant proposed Alternative, road designs would not exceed 10 percent grade and would avoid changing existing surface water runoff patterns by following natural contours and utilizing roadside ditches and subsurface culverts. Excessive grades would be avoided on roads, road embankments, ditches, and drainages whenever possible. See Section 2.3.3.3 for further information. Additionally, road construction would likely increase the probability of human use, which increases the potential for unsanctioned, illegal, and unintentional introductions of exotic fishes and other aquatic organisms.

Stream fishes require habitats for spawning, feeding, rearing, and refuge. The spatial heterogeneity and connectivity of the stream system can necessitate the movement of fishes among these habitats in order

to complete their life cycles (Schlosser 1995). Interruption of movement among required habitats by road crossing can have demographic impacts, decreasing population viability (Gibson et al. 2005; Trombulak and Frissel 2000). Alternative 1R would result in 382 stream crossings under the current conceptual layout. Only two perennial streams would be crossed, Smith Draw and Sage Creek. Both perennial streams would be crossed two times. The current conceptual layout for Alternative 1R does not result in any stream crossings within the Upper Muddy Creek Watershed/Grizzly WHMA or the Red Rim-Grizzly WHMA, even though 8 stream crossings would occur within the McKinney Creek sub-watershed. As discussed in Section 4.13.2, Impacts to Water Resources from Alternative 1R, Applicant proposed Alternative, potential impacts resulting from stream crossings would be minimized through design modifications and placement of structures. The BLM RMP (BLM 2008a) requires that any road crossings any waterbody that potentially supports fish for a portion of the year will be designed to simulate natural stream process, allowing fish passage and potentially reducing the impacts.

Construction of infrastructure and stream crossings within the Upper Muddy Creek Watershed/Grizzly WHMA and the Red Rim-Grizzly WHMA would potentially conflict with the stated management objectives. Based on PCW's ACM to not site facilities within greater sage-grouse core breeding areas (**Appendix C**, **Table C-2**), only a small percentage (5.7 percent; or 3,421 acres) of the total Upper Muddy Creek Watershed/Grizzly WHMA and (2.7 percent, or 1,038 acres) of the total Red Rim-Grizzly WHMA would potentially be impacted by construction of the project. However, the magnitude of these impacts cannot be determined without the final layout. Should the final layout result in the placement of infrastructure within the Upper Muddy Creek/Grizzly WHMA or the Red Rim-Grizzly WHMA additional analysis would be required to determine the potential impacts to fish in the WHMA.

4.14.4 Impacts to Wildlife and Fisheries Resources from Alternative 2, Checkerboard Only

Similar to Alternative 1R, potential impacts to terrestrial and aquatic wildlife resources under the Alternative 2 include the direct loss of habitat, indirect habitat loss due to behavioral avoidance and alterations of movement patterns, degradation of surface water habitats, and mortalities resulting from construction activities, wildlife-vehicle collisions and human interactions. The severity of these effects on wildlife species depend upon factors such as the sensitivity of the species, seasonal use patterns, type and timing of project activity and physical parameters (e.g., topography, cover, forage, climate). As with Alternative 1R, it is assumed that impacts associated with decommissioning of Alternative 2 would be similar to those caused during construction.

Although the potential impacts to wildlife and fisheries from Alternative 2 would be similar to those discussed under Alternative 1R, the amount and location of surface disturbance differs. The Alternative 2 boundary encompasses a total of approximately 182,233 acres, which is 32,240 acres less than Alternative 1R. However, under the conceptual design for Alternative 2 the potential disturbance would be approximately 8,795 acres of initial disturbance and 1,842 acres of long-term disturbance, both are greater than Alternative 1R by 1,574 acres and 298 acres, respectively. The initial disturbance related to the conceptual design for represents 4.8 percent and the long-term disturbance represents 1 percent of the available wildlife habitat within the Alternative 2 boundary. Road construction associated with Alternative 2 is estimated at 477 miles, which is 109 miles more than Alternative 1R.

The location of infrastructure under Alternative 2 would be compressed into the northern portion of the Sierra Madre area and expanded to the east within the Chokecherry area. The Alternative 2 boundary includes 7,562 acres of the Upper Muddy Creek Watershed/Grizzly WHMA and 12 acres of the Red Rim-Grizzly WHMA. Potential impacts from the increase in surface disturbance and the shift in location unique to Alternative 2 are presented below.

4.14.4.1 Big Game

Potential impacts from Alternative 2 to big game include: direct habitat loss of seasonal ranges, behavioral avoidance or indirect habitat loss of seasonal ranges, disruption of migration routes, and increased levels of human activity that could lead to higher levels of vehicle collisions and poaching.

Mule Deer

The Alternative 2 boundary includes and contains a total of 23,548 acres of CWR, 88,633 acres of winter-yearlong range, and 69,181 acres of spring-summer-fall range. The conceptual design for Alternative 2 has the second highest level of direct (254 acres) and second lowest indirect habitat loss (21,786 acres) to mule deer CWR, due to the increased development within the Chokecherry area compared to Alternative 1R. Similar to Alternative 1R, the BLM environmental constraints (refer to **Appendix C**, **Table 1**) restricting surface disturbance and disruptive activities on public lands during November 15 to April 30 in CWR would be followed. In addition, BMPs to reduce the amount of human presence and activity during the winter months would be applied. Under Alternative 2 there also would be increased development on Miller Hill, which would occur closer to the probable migration route for mule deer than under Alternative 1R. Thus, Alternative 2 would potentially have a greater impact on migration routes for mule deer in this area compared to Alternative 1R. Based on the miles of new road required to construct and maintain the project, Alternative 2 has the second highest potential for impact, with 477 miles of new roads within mule deer seasonal ranges. The Alternative 2 boundary includes 7,562 acres of the Upper Muddy Creek Watershed/Grizzly WHMA and 12 acres of the Red Rim-Grizzly WHMA, which is less than Alternative 1R. However, as with Alternative 1R, the portion of the Upper Muddy Creek Watershed/Grizzly WHMA within the Alternative 2 boundary does not contain any CWR for mule deer. Based on PCW's ACM to not site facilities within greater sage-grouse core breeding areas (**Appendix C, Table 2**), the potential area for construction within the Upper Muddy Creek Watershed/Grizzly WHMA would be reduced to 1,953 acres and no construction would occur within the Red Rim-Grizzly WHMA. The direct loss of CWR, combined with expansive areas of potential indirect impacts during construction and operation of the facility, would result in habitat loss and disturbance levels exceeding significance criteria 3.

Elk

Overall, 85 percent of the Alternative 2 boundary area is not classified as elk range. Of the 15 percent that is considered elk range, there is 129 acres of CWR, 1,044 acres of winter range, and 25,596 acres of winter-year long range. Similar to Alternative 1R, Alternative 2 conceptual design has no direct or indirect habitat loss of CWR. The increased construction on Miller Hill under Alternative 2 compared to Alternative 1R would increase the potential impact on the known elk migration route. Based on the miles of new road required to construct and maintain the project, Alternative 2 and Alternative 4 have the second highest potential for impact, with 28 miles of new roads within elk seasonal ranges, thus increasing the potential impacts such as wildlife-vehicle collisions, poaching, disrupting migrations paths, and general disturbance from increased human activity. The Alternative 2 boundary includes 7,562 acres of the Upper Muddy Creek Watershed/Grizzly WHMA and 12 acres of the Red Rim-Grizzly WHMA, which is less than Alternative 1R. However, as with Alternative 1R the portion of the Upper Muddy Creek Watershed/Grizzly WHMA within the Alternative 2 boundary does not contain any CWR for elk. Based on PCW's ACM to not site facilities within greater sage-grouse core breeding areas (**Appendix C**, **Table C-2**), the potential area for construction within the Upper Muddy Creek Watershed/Grizzly WHMA would be reduced to 1,953 acres and no construction would occur within the Red Rim-Grizzly WHMA.

Pronghorn

The Alternative 2 boundary contains 1,200 acres of CWR, 75,473 acres of spring-summer-fall range and 105,561acres of winter-yearlong range. Under the Alternative 2 conceptual design, the potential habitat loss of CWR is the same as Alternative 1R with no direct loss and only a low level (343 acres) of indirect habitat loss. As discussed for Alternative 1R, restricting surface disturbance and disruptive

activities during the time period of November 15 to April 30 on public lands in accordance with the BLM constraints table (**Appendix C**, **Table C-1**) would occur. The increased construction in the eastern portion of the Chokecherry area associated with Alternative 2 would increase the potential impact on known pronghorn migration routes. Similar to Alternative 1R, if fence construction is required, potential impacts to pronghorn migration may be reduced by constructing wildlife-friendly fences allowing pronghorn movement. Based on the miles of new road required to construct and maintain the project (477 miles), Alternative 2 has the second highest potential for wildlife-vehicle collisions, poaching, disrupting migration paths, and general disturbance from increased human activity. The Alternative 2 boundary includes 12 acres of the Red Rim-Grizzly WHMA, which is less than Alternative 1R. Based on PCW's ACM to not site facilities within greater sage-grouse core breeding areas (**Appendix C**, **Table C-2**), no construction would occur within the Red Rim-Grizzly WHMA.

4.14.4.2 Small Game and Furbearers

Potential impacts from Alternative 2 to small game and furbearers include: initial and long-term habitat loss, indirect habitat loss due to behavioral avoidance, and increased levels of human disturbance potentially resulting in wildlife-vehicle collisions and poaching.

The Alternative 2 conceptual design would result in the initial loss of approximately 8,795 acres and the long-term loss of 1,842 acres of habitat. This would result in a loss of relatively small percents of the total Alternative 2 boundary area (4.8 percent and 1.0 percent, respectively), which are similar to Alternative 1R. The loss of habitat may result in small game and furbearers utilizing lower quality habitat, which may affect decrease reproduction and increase predation rates. However, small game and furbearers utilize multiple habitat types and have high reproduction rates. This alternative includes the construction of 477 miles of new roads, which is the second highest amount of road construction among the action alternatives. Thus, Alternative 2 has the second highest potential for wildlife-vehicle collisions, poaching, disrupting migration paths, and general disturbance from increased human activity.

The Alternative 2 boundary includes 7,562 acres of the Upper Muddy Creek Watershed/Grizzly WHMA and 12 acres of the Red Rim-Grizzly WHMA, which is less than Alternative 1R. Management objectives of the Upper Muddy Creek Watershed/Grizzly WHMA do not specifically address small game and furbearers, thus the inclusion of the WHMA within Alternative 2 boundary would not result in any indirect impacts beyond what has been described. As described under Alternative 1R, the Red Rim-Grizzly WHMA does consider small game and furbearers in the management goals for the area. However, based on PCW's ACM to not site facilities within greater sage-grouse core breeding areas (**Appendix C**, **Table C-2**), no construction under Alternative 2 would occur within the Red Rim-Grizzly WHMA. It is not likely that the inclusion of this area would result in any indirect impacts to the small game and furbearers beyond what has been described above. Nor would the inclusion jeopardize the stated management objectives of the Red Rim-Grizzly WHMA in regards to small game and furbearer species.

4.14.4.3 Nongame

Potential impacts from Alternative 2 to bats include direct impacts consisting of fatalities and loss of foraging and roosting habitat, as well as indirect impacts associated with habitat loss and modification.

<u>Bats</u>

Analysis of Alternative 2 involves constructing 1,000 3.0-MW wind turbines in the checkerboard portions of the ranch only. Using the average of 2.1 bat fatalities/MW/year at 21 wind energy facilities in western North America, the predicted bat fatality rate for this alternative would be 6,300 fatalities per year, which is the same as Alternative 1R.

Alternative 2 conceptual design would cause initial impacts to 78.0 acres and long-term impacts to 14 acres of riparian areas/wetlands, which is potential habitat for bat foraging and roosting. This alternative also would result in initial and long-term impacts to 112 acres of woodlands and steep, rocky

areas, which is potential bat roosting habitat. For both riparian areas/wetlands and woodlands combined, this alternative would result in initial and long-term impacts to 190 acres of bat foraging and roosting habitat, which is 5 acres more than Alternative 1R.

As with Alternative 1R, the mortality of an estimated 6,300 bats per year would be considered significant under significance criteria 4.

Birds

Potential impacts from Alternative 2 to birds include direct impacts consisting of fatalities and loss of habitat, as well as indirect impacts associated with habitat loss and modification and displacement of birds from project facilities.

Using the predicted raptor fatality rate of 0.04 fatalities/MW/year indicates that 120 raptor fatalities could occur per year with this alternative, of which 36 may be golden eagles, which is the same as Alternative 1R. These fatalities would be spread over several species, seasons, and between resident, migrant and wintering birds. The conceptual design for Alternative 2 has 218 miles of new above-ground power lines. Alternative 2 has 16 active raptor nests located within 1 mile of turbines based on 2008-2009 surveys. Using the BLM database of all raptor nests documented in the area since 1980, 491 raptor nest locations are present within 1 mile of turbines. Using the average of 1.8 bird fatalities/MW/year at 21 wind energy facilities in western North America, the predicted bird fatality rate for this alternative would be 5,400 fatalities per year, which is the same as Alternative 1R.

The conceptual design for Alternative 2 would result in initial and long-term impacts to 8,795 acres and 1,842 acres, respectively, of all vegetation types combined. This alternative would result in combined initial and long-term disturbance to 8,367 acres of sagebrush or other shrub-steppe communities containing sagebrush. The conceptual design for Alternative 2 has 477 miles of new road construction. Alternative 2 conceptual design has 29,467 acres within 656 feet of all turbines, of which 26,391 acres are sagebrush or shrub-steppe communities with a sagebrush component. These acreages represent 16.2 percent and 14.5 percent of the Alternative 2 boundary area, respectively, compared to 12.6 and 11.3 percent, respectively, for Alternative 1R.

The estimated number of raptor fatalities, as well as the estimated proportion of the Alternative 2 area with reduced use by passerines, would exceed the significance criteria (criteria numbers 3 and 4).

4.14.4.4 Reptiles and Amphibians

Potential impacts likely to occur under Alternative 2 include the direct loss of habitat, indirect habitat loss due to behavioral avoidance and alterations of movement patterns, degradation of surface water habitats, and mortalities resulting from construction activities, wildlife-vehicle collisions and human interactions. The magnitude of these impacts depends upon the density and location of infrastructure and the amount of human activity associated with the development.

The Alternative 2 conceptual design would result in the initial loss of approximately 8,795 acres and the long-term loss of 1,842 acres for habitat. The loss of habitat may result in reduced reptile and amphibian diversity and abundance in the future. The initial and long-term losses would result in the loss of relatively small percentages of the total Alternative 2 boundary area (4.8 percent and 1.0 percent, respectively), which is higher than Alternative 1R for initial impacts and about equal for long-term disturbance.

Alternative 2 includes the construction of 477 miles of new road, thus increasing the potential impacts such as wildlife-vehicle collisions, poaching, disrupting migrations paths, and general disturbance from increased human activity. The combined ecological impacts of road construction on reptiles and amphibians, which influence species demography and gene flow potentially impacting overall population

stability and persistence, were calculated to be an estimated 34,279 acres based on 328 feet beyond the road edge on either side. This amount is greater than Alternative 1R, and represents approximately 19 percent of the total Alternative 2 area.

As discussed under Alternative 1R, amphibians are dependent upon water for completion of their lifecycles and degradation to the aquatic habitats could negatively impact amphibian populations. Based on the assumption that surface disturbance within a given watershed serves as an indicator of the potential for increased sediment and salt runoff, Alternative 2 would result in a slightly greater impact on amphibian habitats as the range of total surface disturbance within sub-watersheds would range from 0.2 to 6.5 percent during construction. Surface disturbance during operations would range from 0.1 to 1.2 percent which is similar to all action alternatives (refer to Section 4.13.3, Impacts to Water Resources from Alternative 2, Checkerboard Only). However, as discussed in Section 4.13, Impacts to Water Resources, with the implementation of erosion control methods, application of BMPs and the ACMs would minimize impacts of land disturbance on surface water quantity and quality. Similar to Alternative 1R, degradation of amphibian habitats by potential spills of hazardous materials from construction equipment is not anticipated based on the establishment of the project's SPCC Plan. The number of stream crossings from the construction of new roads would directly affect amphibian habitats. Under the conceptual design for Alternative 2 there would be 458 ephemeral stream crossings and seven perennial stream crossings. Direct impacts to wetlands, which would reduce potential amphibian habitat, have been estimated along 19,294 linear feet of wetland and riparian zone drainages under Alternative 2 (see to Section 4.11, Vegetation). PCW has committed to BMPs and conservation measures (**Appendix C**, **Table C-2**) that would avoid, minimize, or mitigate wetland impacts.

The boundary for the Alternative 2 area would include 7,562 acres of the Upper Muddy Creek Watershed/Grizzly WHMA and 12 acres of the Red Rim-Grizzly WHMA. Management of the Upper Muddy Creek Watershed/Grizzly WHMA requires that surface disturbing activities avoid the following areas: the identified 100-year floodplains, 500 feet from perennial surface water and/or wetland and riparian areas, and 100 feet from ephemeral channels (BLM 2008a). The avoidance of these areas would reduce the potential impacts on reptiles and amphibians. Exceptions to the avoidance would be granted by the BLM based on an environmental analysis and site-specific engineering and mitigation plans, but would only be granted if the areas cannot be avoided and protection for the aquatic resources would be ensured. Reptiles and amphibians are considered in the Red Rim-Grizzly WHMA management goals by the general statement to ensure that native wildlife and vegetation communities are the primary benefactors of management decisions. Based on PCW's ACM to not site facilities within greater sage-grouse core breeding areas (**Appendix C**, **Table C-2**), only a small percentage (3.3 percent; or 1,953 acres) of the total Upper Muddy Creek Watershed/Grizzly WHMA would potentially be impacted by construction of the project and no construction would occur within the Red Rim-Grizzly WHMA. It is not likely that the inclusion of this area would result in any indirect impacts to the reptiles or amphibians beyond what has been described above. Nor would the inclusion would jeopardize the stated management objectives of the either WHMA in regards to reptiles or amphibians. If the final layout results in placement of infrastructure within either WHMA, impacts to reptiles and amphibians within either WHMA would be the same as those described above.

4.14.4.5 Fisheries

Potential impacts to fish habitat associated with the proposed project include: reduction in surface flow due to water extraction for dust control and construction; degradation of habitat due to increased sedimentation and salt runoff; alteration of hydrologic conditions from new road construction that could lead to sedimentation, erosion, and channel adjustments resulting in a loss of deep pool habitats; and construction of new stream crossings which could result in fragmentation of aquatic habitats and limit access to required habitats or block fish migration. The magnitude of these impacts will depend upon the amount and location of water extraction, the density of road construction within watersheds, the number of stream crossings, and the design of the stream crossings.

Under Alternative 2, the impacts on fisheries from water depletions associated with construction would be similar to those discussed under Alternative 1R. As explained in Section 4.13.2, Impacts to Water Resources from Alternative 1R, Applicant proposed Alternative, it is estimated that Alternative 2 would require up to 603 acre-feet of water from the North Platte River during the 4-year construction of the proposed project, with the greatest use (344 acre-feet) occurring during the first year. It is possible that up to 60 acre-feet of the water required for construction would be extracted from the Colorado River watershed (PCW 2010a) with the greatest use (34 acre-feet) occurring during the first year. These amounts are greater than Alternative 1R. Section 4.13.2, Impacts to Water Resources from Alternative 1R, Applicant proposed Alternative, estimates that this equates to approximately 0.04 percent of the North Platte River's average annual flow near Sinclair and approximately 0.25 percent of the average annual flow of Muddy Creek near Baggs, Wyoming, or 0.05 percent of Savery Creek's average annual flow near Savery, Wyoming. Similar to Alternative 1R, this level of depletion would have a major impact to the local fishery and could potentially alter survival of fish in the system through changes such as water temperature, in-stream habitat, and sediment dynamics. This type of impact does not coincide with the management goals for the Upper Muddy Creek Watershed/Grizzly WHMA and Red Rim-Grizzly WHMA for fish and would potentially contribute to the decline of populations. This also may preclude the recovery of BLM sensitive fish species. The level of impact also would depend on the water year. Depletions from the North Platte River would not be allowed to impact current users or interstate agreements through the water rights processes required by the WSEO. At this time the exact locations for water extraction have not been identified, but prior to the Final EIS this information will be determined and additional analysis for potential impacts to fisheries will be conducted. The potential impacts from increased sedimentation including shifting habitat structure, percent fines in substrates and cover availability was assessed based on the amount of total surface disturbance within sub-watersheds. Under Alternative 2, the total surface disturbance in the North Platte River-Coal Mine Draw sub-watershed, which contains a statewide important fishery, would be 1.0 percent during construction and 0.2 percent during operations. The total surface disturbance in the Upper Sage Creek-North Platte River sub-watershed, which contains three of the noted fisheries, would be 0.8 percent during construction and 0.1 percent during operations, which are greater and lower respectively than Alternative 1R. Under Alternative 2 conceptual design, total surface disturbance in the McKinney Creek sub-watershed, which contains the other three noted fisheries plus portions of the Upper Muddy Creek Watershed/Grizzly WHMA and Red Rim-Grizzly WHMA, would be greater than Alternative 1R both during construction and operation (1.3 percent and 0.3 percent, respectively). As discussed under Alternative 1R, implementation of BMPs and ACMs would minimize the potential impacts including sedimentation, contamination, and changes in habitat structure resulting from surface disturbance; accidental contamination from construction spills; and construction of access road-stream crossings.

As with Alternative 1R, disruption in fish movement resulting from access road-stream crossings would potentially result in demographic impacts, decreasing population viability. The conceptual design for Alternative 2 would result in a greater number of stream crossings (465) compared to Alternative 1R (386). A total of five perennial streams would be crossed including; Smith Draw, Iron Springs Draw, Miller Creek, Little Sage Creek, and Sage Creek. Both Smith Draw and Sage Creek would be crossed twice; all other perennial streams would be crossed only once. Sage Creek is a regionally important trout stream. Under the current conceptual layout, no perennial and one ephemeral stream crossing would occur in the McKinney Creek sub-watershed. As discussed in Section 4.13.2, Impacts to Water Resources from Alternative 1R, Applicant proposed Alternative, potential impacts resulting from stream crossings would be minimized through design modifications and placement of structures. The BLM RMP (BLM 2008a) requires that any road crossing any waterbody that potentially supports fish for a portion of the year will be designed to simulate natural stream process, thus allowing fish passage potentially reducing the impacts.

As stated under Alternative 1R, construction infrastructure and stream crossings within the Upper Muddy Creek Watershed/Grizzly WHMA and the Red Rim-Grizzly WHMA would potentially conflict with the stated management objectives. Based on PCW's ACM to not site facilities within greater sage-grouse

core breeding areas (**Appendix C**, **Table C-2**), impacts within the Upper Muddy Creek Watershed/Grizzly WHMA are anticipated to be minimal based on the small percentage (3.3 percent; or 1,953 acres) of the total Upper Muddy Creek Watershed/Grizzly WHMA potentially impacted by construction of the project and no construction would occur within the Red Rim-Grizzly WHMA (**Figure 4.14-2**). The magnitude of the potential impacts resulting from possible construction within the Upper Muddy Creek/Grizzly WHMA cannot be determined without the final layout. Should the final layout result in the placement of infrastructure within the Upper Muddy Creek/Grizzly WHMA, additional analysis would be required to determine the potential impacts to fisheries.

4.14.5 Impacts to Wildlife and Fisheries Resources from Alternative 3, No Miller Hill

Similar to Alternative 1R, impacts to terrestrial wildlife resources under Alternative 3 include the direct loss of habitat, indirect habitat loss due to behavioral avoidance and alterations of movement patterns, degradation of surface water habitats, and mortalities resulting from construction activities, wildlife-vehicle collisions and human interactions. The severity of these effects on wildlife species depend upon factors such as the sensitivity of the species, seasonal use patterns, type and timing of project activity and physical parameters (e.g., topography, cover, forage, climate). As with Alternatives 1R and 2, it is assumed that impacts associated with decommissioning of Alternative 3 would be similar to those caused during construction.

Although types of potential impacts to wildlife and fisheries from Alternative 3 would be similar to those discussed under Alternative 1R, the amount and location of the surface disturbance differs. Alternative 3 boundary encompasses a total of approximately 155,883 acres, which is 59,677 acres less than Alternative 1R. However, under the conceptual design for Alternative 3 the potential disturbance would be approximately 8,504 acres of initial disturbance and 1,780 acres of long-term disturbance, both being greater than Alternative 1R by 1,283 acres and 236 acres, respectively. Under Alternative 3, the initial disturbance represents 3 percent and the long-term disturbance represents 1.1 percent of the available wildlife habitat within the Alterative 3 area. Road construction associated with the conceptual design for Alternative 3 is estimated at 459 miles, which is 91 miles more than Alternative 1R.

Under Alternative 3 infrastructure would not occur within the Miller Hill or southern portion of Sierra Madre, but would increase construction in the eastern portion of the Sierra Madre area. Development in the Chokecherry area would be the same as Alternative 2. The Alterative 3 boundary does not include the Upper Muddy Creek Watershed/Grizzly WHMA or the Red Rim-Grizzly WHMA. Potential impacts from the increase in surface disturbance and the shift in location unique to Alternative 3 are presented below.

4.14.5.1 Big Game

Similar to the other action alternatives, potential impacts from Alternative 3 to big game include: direct habitat loss of seasonal ranges, behavioral avoidance or indirect habitat loss of seasonal ranges, disruption of migration routes, and increased levels of human activity that could lead to higher levels of vehicle collisions and poaching.

<u>Mule Deer</u>

The Alternative 3 boundary area contains a total of 23,548 acres of CWR, 88,593 acres of winter-yearlong range, and 42,870 acres of spring-summer-fall range. The conceptual design for Alternative 3 has the highest level of direct habitat loss (260 acres) and indirect habitat loss (21,863 acres) of mule deer CWR. Similar for Alternatives 1R and 2, the BLM environmental constraints (refer to **Appendix C**, **Table C-1**) restricting surface disturbance and disruptive activities during the time

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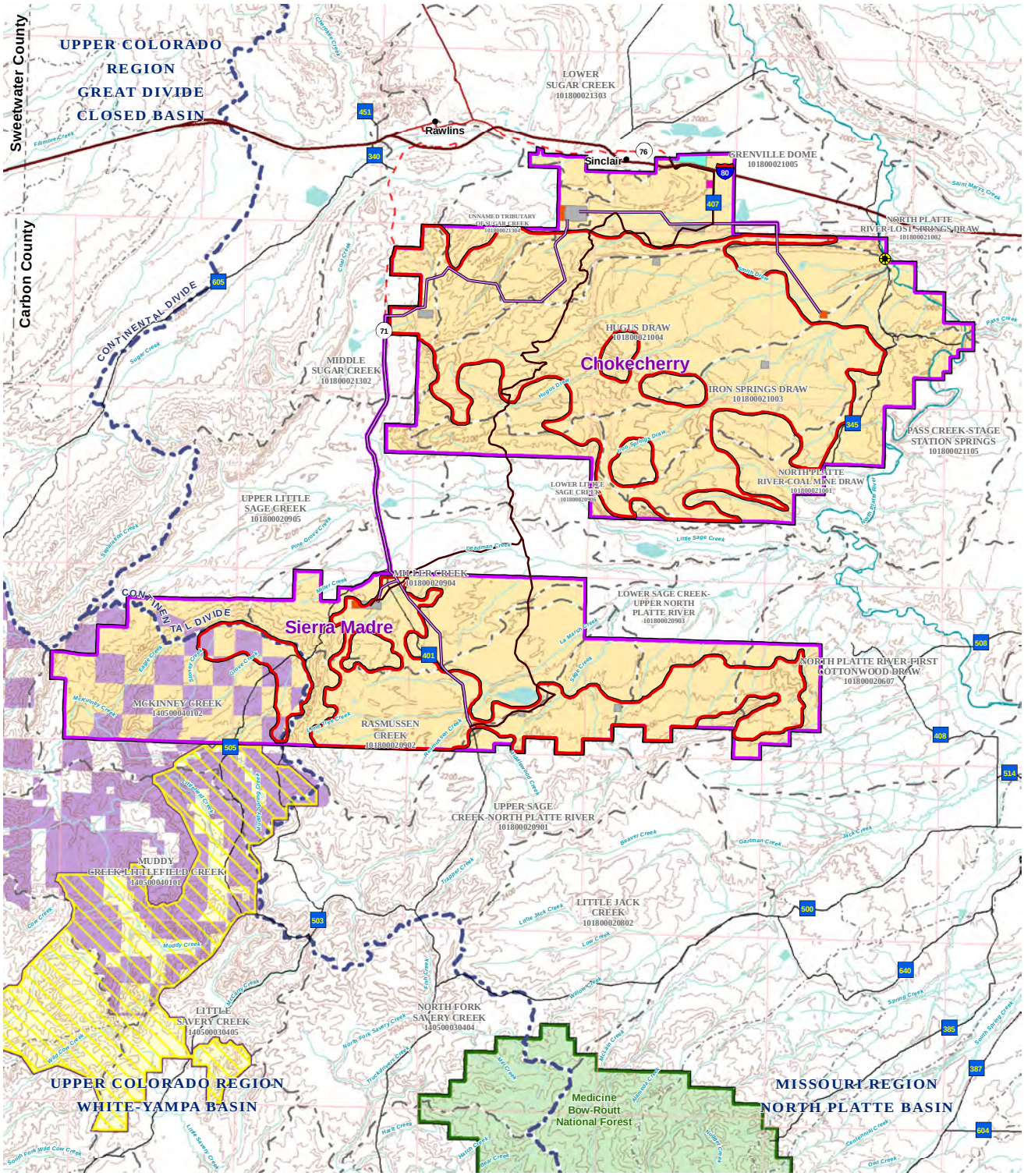

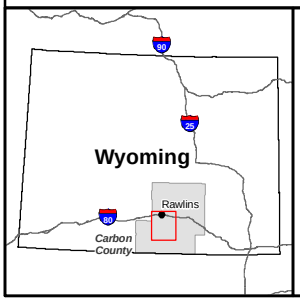

Legend

- Project Area
- Likely Area of Turbine Construction

Project Facilities

- Water Extraction Site
- Alternate O&M Facility
- Intermodal Rail Facility
- Staging Area (Construction Only)
- Substation
- Transmission Line
- Haul Road
- Continental Divide
- River or Creek
- Lake or Reservoir
- Hydrologic Basin
- Upper Muddy Creek/ Grizzly Wildlife Habitat Management Area
- Red Rim - Grizzly Wildlife Habitat Management Area

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.14-2

Impacts to the Upper Muddy Creek/ Grizzly Wildlife Habitat Management Area (WHMA) from Alternative 2

0 1 2 3 4 5 Miles
0 1 2 3 4 5 10 Kilometers
1:320,000
N

period of November 15 to April 30 would be observed. Furthermore, the use of BMPs designed to reduce the amount of human presence and activity during winter months would be applied. Based on the miles of new road required to construct and maintain the project, Under Alternative 3 there would be no development on Miller Hill, thus the known migration route for mule deer would not likely be affected. This is the only alternative that would avoid development in this area, thus, Alternative 3 would potentially have the least impact on migration routes for mule deer in this area. The Alternative 3 conceptual design has the second lowest potential for impact, with 459 miles of new roads within mule deer seasonal ranges. The direct loss of CWR, combined with expansive areas of potential indirect impacts during construction and operation of the facility, would result in habitat loss and disturbance levels exceeding significance criteria 3.

Elk

Overall, 99 percent of the Alternative 3 boundary area is not classified as elk range. Of the 1 percent that is considered elk range, there is no CWR, 571 acres of winter range, and 424 acres of winter-year long range. The conceptual design for Alternative 3 has no direct or indirect habitat loss of CWR, which is similar to Alternatives 1R and 2. Under Alternative 3 there would be no development on Miller Hill, thus no anticipated impacts to probable elk migration routes would occur. Furthermore, no new road construction is proposed in elk seasonal ranges, thus Alternative 3 has the lowest potential for impact to elk compared to Alternatives 1R and 2.

Pronghorn

The Alternative 3 boundary contains 1,200 acres of CWR, 49,122 acres of spring-summer-fall range and 105,561 acres of winter-yearlong range. Alternative 3 conceptual design has no direct habitat loss and a low level of indirect habitat loss (343 acres) of CWR for pronghorn, which is consistent with Alternatives 1R and 2. Similar for Alternatives 1R and 2, the BLM environmental constraints (refer to **Appendix C**, **Table C-1**) restricting surface disturbance and disruptive activities during the time period of November 15 to April 30 would be observed. Furthermore, the use of BMPs designed to reduce the amount of human presence and activity during winter months would be applied. Construction in the Chokecherry area is the same as Alternative 2, thus the proposed construction in the eastern portion of the Chokecherry area would increase the potential impact on probable pronghorn migration routes. Similar to Alternatives 1R and 2, if fence construction is required, potential barriers to pronghorn migration may be reduced by constructing wildlife-friendly fences allowing pronghorn movement. Alternative 2 conceptual design would require the second lowest amount of new road construction with 459 miles within pronghorn seasonal ranges. Based on the miles of new road construction, Alternative 3 would have less potential impacts such as wildlife- vehicle collisions, poaching, and general disturbance from increased human activity compared to Alternative 2, but greater potential than Alternative 1R.

4.14.5.2 Small Game and Furbearers

Potential impacts from Alternative 3 to small game and furbearers include: initial and long-term habitat loss, indirect habitat loss due to behavioral avoidance, and increased levels of human disturbance potentially resulting in wildlife-vehicle collisions and poaching.

Alternative 3 conceptual design would result in the initial loss of approximately 8,504 acres and the long-term loss of 1,780 acres of habitat. The loss of habitat may result in small game and furbearers utilizing lower quality habitat which may affect decrease reproduction and increase predation rates. However, small game and furbearers utilize multiple habitat types and have high reproduction rates. The loss of habitat would result in the relatively small percentages of the total area encompassed by Alternative 3 boundary (5.5 percent and 1.1 percent, respectively), which is the greatest initial disturbance among alternatives. The conceptual design for this alternative includes the construction of 459 miles of new roads, which increases the potential for wildlife-vehicle collisions, poaching, disrupting migration paths, and general disturbance from increased human activity.

4.14.5.3 Nongame

Potential impacts from Alternative 3 to bats include direct impacts consisting of fatalities and loss of foraging and roosting habitat, as well as indirect impacts associated with habitat loss and modification.

Bats

Analysis of Alternative 3 involves constructing 1,000 3.0-MW wind turbines in the alternative area but excludes placement of project infrastructure in the Miller Hill and Sierra Madre areas. Using the average of 2.1 bat fatalities/MW/year at 21 wind energy facilities in western North America, the predicted bat fatality rate for this alternative also would be 6,300 fatalities per year, which is the same as Alternative 1R.

Alternative 3 conceptual design would cause initial impacts to 85 acres and long-term impacts to 13 acres of riparian areas/wetlands, which is potential habitat for bat foraging and roosting. The conceptual design for Alternative 3 also would result in initial and long-term impacts to 111 acres of woodlands and steep, rocky areas, which is potential bat roosting habitat. For both riparian areas/wetlands and woodlands combined, this alternative would result in initial and long-term impacts to 183 acres of bat foraging and roosting habitat, which is 2 acres less than Alternative 1R.

As with Alternative 1R, the mortality of an estimated 6,300 bats per year would be considered significant under significance criteria 4.

Birds

Potential impacts from Alternative 3 to birds include direct impacts consisting of fatalities and loss of habitat, as well as indirect impacts associated with habitat loss and modification and displacement of birds from project facilities.

Using the predicted raptor fatality rate of 0.04 fatalities/MW/year indicates that 120 raptor fatalities could occur per year under this alternative, of which 36 may be golden eagles. These fatalities would be spread over several species, seasons, and between resident, migrant and wintering birds. Alternative 3 has 217 miles of new above-ground power lines. Alternative 3 has 12 active raptor nests located within 1 mile of turbines based on 2008-2009 surveys. Using the BLM database of all raptor nests documented in the area since 1980, 366 raptor nest locations are present within 1 mile of turbines. Using the average of 1.8 bird fatalities/MW/year at 21 wind energy facilities in western North America, the predicted bird fatality rate for this alternative would be 5,400 fatalities per year, which is the same as Alternative 1R.

The Alternative 3 conceptual design would result in initial and long-term impacts to 8,504 acres and 1,780 acres, respectively, of all vegetation types combined. The conceptual design would result in initial and long-term disturbance to 8,177 acres of sagebrush or other shrub-steppe communities containing sagebrush. Alternative 3 conceptual design has 459 miles of new road construction. The conceptual design for Alternative 3 has 29,603 acres within 656 feet of all turbines, of which 26,313 acres are sagebrush or shrub-steppe communities with a sagebrush component. These acreages represent 19.0 percent and 16.9 percent of the Alternative 3 boundary area, respectively, compared to 12.6 and 11.3 percent respectively, for Alternative 1R.

The estimated number of raptor fatalities, as well as the estimated proportion of the Application Area with reduced use by passerines would exceed the significance criteria (criteria numbers 3 and 4).

4.14.5.4 Reptiles and Amphibians

Potential impacts likely to occur under Alternative 3 include the direct loss of habitat, indirect habitat loss due to behavioral avoidance and alterations of movement patterns, degradation of surface water habitats, and mortalities resulting from construction activities, wildlife-vehicle collisions and human

interactions. The magnitude of these impacts depends upon the density and location of infrastructure and the amount of human activity associated with the development.

The conceptual design for Alternative 3 would result in the loss of approximately 8,504 acres for the initial disturbance and 1,780 acres of long-term disturbance. The loss of habitat may result in reduced reptile and amphibian diversity and abundance in the future. The initial and long-term losses would result in the loss of relatively small percentages of the total Alternative 3 boundary area (5.5 percent and 1.1 percent, respectively) which would be the second highest loss among the action alternatives.

This alternative conceptual design includes the construction of 459 miles of new roads, thus increasing the potential impacts such as wildlife-vehicle collisions, poaching, disrupting migrations paths, and general disturbance from increased human activity. The combined ecological impacts of road construction on reptiles and amphibians, which influence species demography and gene flow potentially impacting overall population stability and persistence, were calculated to be an estimated 33,911 acres, based on 328 feet beyond the road edge on either side. This amount is greater than Alternative 1R, and represents approximately 22 percent of the total Alternative 3 boundary area.

As discussed under Alternative 1R, amphibians are dependent upon water for completion of their life cycles and degradation to the aquatic habitats could negatively impact amphibian populations. Based on the assumption that surface disturbance within a given watershed serves as an indicator of the potential for increased sediment and salt runoff, Alternative 3 would have a slightly greater impact on amphibian habitats compared to Alternative 1R and 2 as the range of total surface disturbance within sub-watersheds would range from less than 0.1 to 6.6 percent during construction. Surface disturbance during operations would range from 0.1 to 1.3 percent which is similar to all action alternatives (refer to Section 4.13.4, Impacts to Water Resources from Alternative 3, No Miller Hill or Sierra Madre). However, as discussed in Section 4.13, Impacts to Water Resources, with the implementation of erosion control methods, application of BMPs and the ACMs would minimize impacts of land disturbance on surface water quantity and quality. Similar to Alternative 1R, degradation of amphibian habitats by potential spills of hazardous materials from construction equipment is not anticipated based on the establishment of the project's SPCC Plan. The number of stream crossings from the construction of new roads would directly affect amphibian habitats. Under the conceptual design for Alternative 3 there would be 450 ephemeral stream crossings and seven perennial stream crossings. Direct impacts to wetlands, which would reduce potential amphibian habitat, have been estimated along 16,174 linear feet of wetland and riparian zone drainages under Alternative 3 (see to Section 4.11, Vegetation). PCW has committed to BMPs and conservation measures (**Appendix C**, **Table C-2**) that would avoid, minimize, or mitigate wetland impacts.

4.14.5.5 Fisheries

Potential impacts to fish habitat associated with the proposed project include reduction in surface flow due to water extraction for dust control and construction; degradation of habitat due to increased sedimentation and salt runoff; alteration of hydrologic conditions from new road construction that could lead to sedimentation, erosion, and channel adjustments resulting in a loss of deep pool habitats; and construction of new stream crossings which could result in fragmentation of aquatic habitats and limit access to required habitats or block fish migration. The magnitude of these impacts will depend upon the amount and location of water extraction, the density of road construction within watersheds, the number of stream crossings, and the design of the stream crossings.

Under Alternative 3, the impacts on fisheries from water depletions associated with construction would be similar to those discussed under Alternative 1R. As explained in Section 4.13.2, Impacts to Water Resources from Alternative 1R, Applicant proposed Alternative, it is estimated that Alternative 3 would require up to 584 acre-feet of water from the North Platte River during the 4-year construction of the proposed project, with the greatest use (333 acre-feet) occurring during the first year, which is slightly

less than either Alternative 1R or 2. It is possible that up to 58 acre-feet of the water required for construction would be extracted from the Colorado River watershed (PCW 2010a) with the greatest use (33 acre-feet) occurring during the first year. Section 4.13.2, Impacts to Water Resources from Alternative 1R, Applicant proposed Alternative, estimates that this equates to approximately 0.04 percent of the North Platte River's average annual flow near Sinclair and approximately 0.24 percent of the average annual flow of Muddy Creek near Baggs, Wyoming, or 0.05 percent of Savery Creek's average annual flow near Savery, Wyoming. Similar to Alternative 1R and 2, this level of depletion would have a major impact to the local fishery and could potentially alter survival of fish in the system through changes such as water temperature, in-stream habitat, and sediment dynamics. This type of impact does not coincide with the management goals for the Upper Muddy Creek Watershed/Grizzly WHMA and Red Rim-Grizzly WHMA for fish and would potentially contribute to the decline of populations. This also may preclude the recovery of BLM sensitive fish species. The level of impact also would depend on the water year. Depletions from the North Platte River would not be allowed to impact current users or interstate agreements through the water rights processes required by the WSEO. At this time the exact locations for water extraction have not been identified, but prior to the Final EIS this information will be determined and additional analysis for potential impacts to fisheries will be conducted.

The potential impacts from increased sedimentation including shifting habitat structure, percent fines in substrates and cover availability was assessed based on the amount of total surface disturbance within sub-watersheds. Under Alternative 3 conceptual design, the total surface disturbance in the North Platte River-Coal Mine Draw sub-watershed, which contains a statewide important fishery, would be 1.2 percent during construction and 0.2 percent during operations. The total surface disturbance in the Upper Sage Creek-North Platte River sub-watershed, which contains three of the noted fisheries, would be 0.8 percent during construction, and 0.1 percent during operations. The construction percent is greater than both Alternative 1R and 2, but the operations percent would be similar among all action alternatives. Under the conceptual design for Alternative 3, no surface disturbance would occur within the McKinney Creek sub-watershed, thus fisheries associated with the Upper Muddy Creek Watershed/Grizzly WHMA and the Red Rim-Grizzly WHMA would not be affected (**Figure 4.14-3**). As discussed under Alternative 1R, implementation of BMPs and ACMs would minimize the potential impacts including sedimentation, contamination, and changes in habitat structure resulting from surface disturbance; accidental contamination from construction spills; and construction of access road-stream crossings.

As with Alternative 1R, disruption in fish movement resulting from access road-stream crossings would potentially result in demographic impacts, decreasing population viability. The Alternative 3 conceptual design would result in a greater number of stream crossings (457) compared to Alternative 1R (386), but less than Alternative 2 (465). Similar to Alternative 2, a total of five perennial streams would be crossed including; Smith Draw, Iron Springs Draw, Miller Creek, Little Sage Creek, and Sage Creek. Both Smith Draw and Sage Creek would be crossed twice; all other perennial streams would be crossed only once. Sage Creek is a regionally important trout stream. Similar to Alternatives 1R and 2, no perennial stream crossings would occur in the McKinney Creek sub-watershed. As discussed in Section 4.13.2, Impacts to Water Resources from Alternative 1R, Applicant proposed Alternative, potential impacts resulting from stream crossings would be minimized through design modifications and placement of structures. The BLM RMP (BLM 2008a) requires that any road crossing any waterbody that potentially supports fish for a portion of the year will be designed to simulate natural stream process, thus allowing fish passage potentially reducing the impacts.

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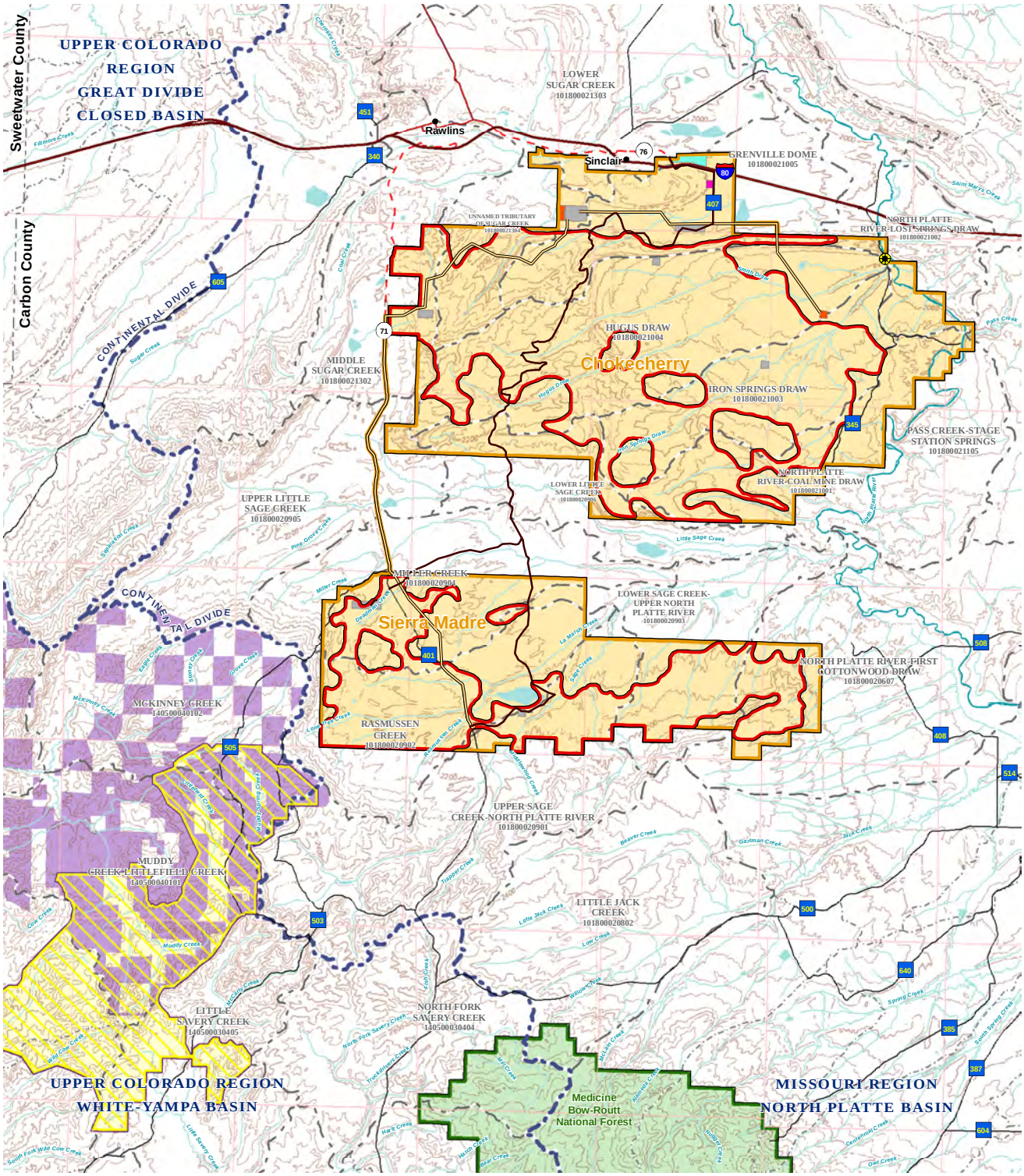

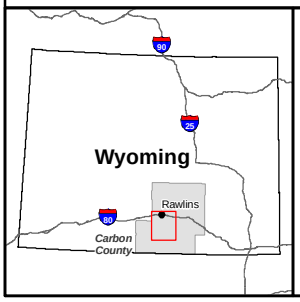

Legend

- Project Area
- Likely Area of Turbine Construction

Project Facilities

- Water Extraction Site
- Alternate O&M Facility
- Intermodal Rail Facility
- Staging Area (Construction Only)
- Substation
- Transmission Line
- Haul Road
- Continental Divide
- River or Creek
- Lake or Reservoir
- Hydrologic Basin
- Upper Muddy Creek/ Grizzly Wildlife Habitat Management Area
- Red Rim - Grizzly Wildlife Habitat Management Area

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.14-3

Impacts to the Upper Muddy Creek/ Grizzly Wildlife Habitat Management Area (WHMA) from Alternative 3

0 1 2 3 4 5 Miles
0 1 2 3 4 5 10 Kilometers
1:320,000
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4.14.6 Impacts to Wildlife and Fisheries Resources from Alternative 4, Private Lands Only

Similar to Alternative 1R, impacts to terrestrial wildlife resources under Alternative 4 include the direct loss of habitat, indirect habitat loss due to behavioral avoidance and alterations of movement patterns, degradation of surface water habitats, and mortalities resulting from construction activities, wildlife-vehicle collisions and human interactions. The severity of these effects on wildlife species depend upon factors such as the sensitivity of the species, seasonal use patterns, type and timing of project activity and physical parameters (e.g., topography, cover, forage, climate). As with the other action alternatives, it is assumed that impacts associated with decommissioning of Alternative 4 would be similar to those caused during construction.

Although types of potential impacts to wildlife and fisheries from Alternative 4 would be similar to those discussed under Alternative 1R, the amount and location of surface disturbance differs. The Alternative 4 boundary encompasses a total of approximately 215,729 acres, which is 169 acres more than Alternative 1R. Under Alternative 4 conceptual design the potential surface disturbance would be approximately 8,918 acres of initial disturbance and 1,871 acres of long-term disturbance, both are greater than Alternative 1R by 1,697 acres and 327 acres, respectively. Under the conceptual design for Alternative 4, the initial disturbance represents 4.1 percent and the long-term disturbance represents 0.9 percent of the available wildlife habitat within the Alternative 4 boundary area. Road construction associated with the conceptual design for Alternative 4 is estimated at 513 miles, which is 145 miles more than Alternative 1R. Additionally, as opposed to all other alternatives, Alternative 4 would only construct 846 turbines.

The location of infrastructure under Alternative 4 would occur only on private lands, which would result in infrastructure to be constructed throughout most of the Alternative 4 area. Potential impacts from the increase in surface disturbance and the expansion throughout the alterative area unique to Alternative 4 are presented below.

The boundary for Alternative 4 is the same as Alternative 1R and includes portions of the Upper Muddy Creek Watershed/Grizzly WHMA and the Red Rim-Grizzly WHMA, but the conceptual layout does not include development occurring within either WHMA due to Alternative 4 only including development on private land.

4.14.6.1 Big Game

Potential impacts from Alternative 4 to big game include: direct habitat loss of seasonal ranges, behavioral avoidance or indirect habitat loss of seasonal ranges, disruption of migration routes, and increased levels of human activity that could lead to higher levels of vehicle collisions and poaching.

<u>Mule Deer</u>

Alternative 4 contains a total of 23,538 acres of CWR, 88,633 acres of winter-year-long range, and 102,676 acres of spring-summer-fall range. The Alternative 4 conceptual design has the second lowest level of direct habitat loss (244 acres) and the second highest level of indirect habitat loss (21,814 acres) to mule deer CWR. Although Alternative 4 expands the distribution of turbines throughout the Chokecherry area, there would be fewer turbines and a reduction in direct loss of CWR habitat for mule deer compared to Alternatives 2 and 3. However, the expansion would result in a greater indirect impact to mule deer CWR as noted above. Under Alternative 4 development on Miller Hill would be similar to Alternative 2, which would occur closer to the known migration route for mule deer than Alternative 1R. Alternative 3 avoids construction on Miller Hill. Therefore Alternatives 2 and 4 would potentially have the greatest impact on migration routes for mule deer in this area. Based on the conceptual design the miles of new road required to construct and maintain the project (513 miles) in mule deer seasonal ranges, Alternative 4 has the highest potential for wildlife-vehicle collisions, poaching, disrupting migration paths, and general disturbance from increased human activity. The direct loss of CWR, combined with

expansive areas of potential indirect impacts during construction and operation of the facility, would result in habitat loss and disturbance levels exceeding significance criteria number 3.

Elk

Similar to Alternative 1R, 74 percent of the Alternative 4 boundary area is not classified as elk range. Of the 26 percent that is considered elk range, there is 129 acres of CWR, 1,044 acres of winter range, 33,462 acres of winter-year long range, and 20,863 acres of spring-summer-fall range. Similar to all other alternatives, Alternative 4 conceptual design has no direct or indirect habitat loss of CWR. As with all the other action alternatives, with the exception of Alternative 3, Alternative 4 would include development on Miller Hill. Potential impacts to the known elk migration route in this area for Alternative 4 would be similar to Alternative 2 as it would be closer to the known route. Based on conceptual design the miles of new road required to construct and maintain Alternative 4, along with Alternative 2 have the highest potential for impact, with 28 miles of new roads within elk seasonal ranges. Therefore, Alternative 4 has the greatest potential for impacts such as inadvertent mortality from vehicle collisions, poaching, and general disturbance from increased human activity.

Pronghorn

The Alternative 4 boundary contains 1,200 acres of CWR, 108,968 acres of spring-summer-fall range and 105,561 acres of winter-yearlong range. The conceptual design for Alternative 4 has no direct habitat loss and a low level of indirect habitat loss (343 acres) that is consistent with the other alternatives. Based on the miles of new road required to construct and maintain the project (513 miles), Alternative 4 has the highest potential for wildlife-vehicle collisions, poaching, disrupting migration paths, and general disturbance from increased human activity.

4.14.6.2 Small Game and Furbearers

Potential impacts from Alternative 4 to small game and furbearers include: initial and long-term habitat loss, indirect habitat loss due to behavioral avoidance, and increased levels of human disturbance potentially resulting in wildlife-vehicle collisions and poaching.

The conceptual design for Alternative 4 would result in the initial loss of approximately 8,918 acres and the long-term loss of 1,871 acres of habitat. The loss of habitat may result in small game and furbearers utilizing lower quality habitat, which may affect decrease reproduction and increase predation rates. However, small game and furbearers utilize multiple habitat types and have high reproduction rates. This would result in the loss of a relatively small percentage of the total Alternative 4 boundary area (4.1 percent and 0.9 percent, respectively), which is similar to the alternatives. However, the conceptual design for this alternative includes the construction of the greatest amount of new roads, 513 miles, which increases the potential for wildlife-vehicle collisions, poaching, disrupting migration paths, and general disturbance from increased human activity.

4.14.6.3 Nongame

Bats

Potential impacts from Alternative 4 to bats include direct impacts consisting of fatalities and loss of foraging and roosting habitat, as well as indirect impacts associated with habitat loss and modification.

Alternative 4 would entail constructing 854 3.0-MW wind turbines only on private lands within the Alternative 4 area. Because Alternative 4 only has 854 turbines, bat collision mortality would be approximately 15 percent lower than the other alternatives, or 5,380 fatalities per year.

The conceptual design for Alternative 4 would cause initial impacts to 95 acres and long-term impacts to 14 acres of riparian areas/wetlands, which is potential habitat for bat foraging and roosting. The

conceptual design for this alternative also would result in initial and long-term impacts to 123 acres of woodlands and steep, rocky areas, which is potential bat roosting habitat. For both riparian areas/wetlands and woodlands combined, this alternative would result in initial and long-term impacts to 204 acres of bat foraging and roosting habitat, which is 69.4 acres more than Alternative 1R.

Collision mortality of an estimated 5,380 bats per year would be considered significant under significance criteria 1.

Birds

Potential impacts from Alternative 4 to birds include direct impacts consisting of fatalities and loss of habitat, as well as indirect impacts associated with habitat loss and modification and displacement of birds from project facilities.

Because Alternative 4 only has 854 turbines, raptor and all bird collision mortality would be approximately 15 percent lower than the other three alternatives, or 102 raptor fatalities, of which 31 may be golden eagles, and 4,612 bird fatalities per year. These fatalities would be spread over several species, seasons, and between resident, migrant and wintering birds. Alternative 4 has 182 miles of new above-ground power lines. Alternative 4 has 19 active raptor nests located within 1 mile of turbines based on 2008-2009 surveys. Using the BLM database of all raptor nests documented in the Alternative 4 area since 1980, 562 raptor nest locations are present within 1 mile of turbines.

The conceptual design for Alternative 4 would result in initial and long-term impacts to 8,918 acres and 1,871 acres, respectively, of all vegetation types combined. This alternative conceptual design would result in combined initial and long-term disturbance to 8,230 acres of sagebrush or other shrub-steppe communities containing sagebrush. Alternative 4 conceptual design has 513 miles of new road construction. The conceptual design for Alternative 4 has 25,179 acres within 656 feet of all turbines, of which 21,197 acres are sagebrush or shrub-steppe communities with a sagebrush component. These acreages represent 11.7 percent and 9.8 percent of the Alternative 4 boundary area, respectively, compared to 12.6 and 11.3 percent, respectively, for Alternative 1R.

The estimated number of raptor fatalities, as well as the estimated proportion of the Alternative 4 boundary area with reduced use by passerines would exceed the significance criteria 3 and 4.

4.14.6.4 Reptiles and Amphibians

Potential impacts likely to occur under Alternative 4 include the direct loss of habitat, indirect habitat loss due to behavioral avoidance and alterations of movement patterns, degradation of surface water habitats, and mortalities resulting from construction activities, wildlife-vehicle collisions and human interactions. The magnitude of these impacts depends upon the density and location of infrastructure and the amount of human activity associated with the development.

The Alternative 4 conceptual design would result in the initial loss of approximately 8,918 acres and the long-term loss of 1,871 acres of habitat. The loss of habitat may result in reduced reptile and amphibian diversity and abundance in the future. The initial and long-term losses would result in the loss of relatively small percentages of the total Alternative 4 boundary area (4.1 percent and 0.9 percent, respectively) which would be similar to the other alternatives.

The conceptual design for Alternative 4 includes the construction of 513 miles of new road, thus increasing the potential impacts such as wildlife-vehicle collisions, poaching, disrupting migrations paths, and general disturbance from increased human activity. The combined ecological impacts of road construction on reptiles and amphibians, which influence species demography and gene flow potentially impacting overall population stability and persistence, were calculated to be an estimated 36,490 acres,

based on 328 feet beyond the road edge on either side. This amount is greater than Alternative 1R, and represents approximately 17 percent of the total Alternative 4 boundary area.

As discussed under Alternative 1R, amphibians are dependent upon water for completion of their lifecycles and degradation to the aquatic habitats could negatively impact amphibian populations. Based on the assumption that surface disturbance within a given watershed serves as an indicator of the potential for increased sediment and salt runoff, Alternative 4 conceptual design would have a slightly lower impact on amphibian habitats as the range of total surface disturbance within sub-watersheds would range from 0.1 to 5.6 percent during construction. Surface disturbance during operations would range from 0.1 to 1.2 percent which is similar to all action alternatives (refer to Section 4.13.5, Impacts to Water Resources from Alternative 4, Private Lands Only). However, as discussed in Section 4.13, Impacts to Water Resources, with the implementation of erosion control methods, application of BMPs and the ACMs would minimize impacts of land disturbance on surface water quantity and quality. Similar to Alternative 1R, degradation of amphibian habitats by potential spills of hazardous materials from construction equipment is not anticipated based on the establishment of the project's SPCC Plan. The number of stream crossings from the construction of new roads would directly affect amphibian habitats. Under the conceptual design for Alternative 4 there would be 531 ephemeral stream crossings and 10 perennial stream crossings. Direct impacts to wetlands, which would reduce potential amphibian habitat, have been estimated along 23,125 linear feet of wetland and riparian zone drainages under Alternative 4 (see to Section 4.11, Vegetation). PCW has committed to BMPs and conservation measures (**Appendix C, Table C-2**) that would avoid, minimize, or mitigate wetland impacts.

4.14.6.5 Fisheries

Potential impacts to fish habitat associated with the proposed project include: reduction in surface flow due to water extraction for dust control and construction; degradation of habitat due to increased sedimentation and salt runoff; alteration of hydrologic conditions from new road construction that could lead to sedimentation, erosion, and channel adjustments resulting in a loss of deep pool habitats; and construction of new stream crossings which could result in fragmentation of aquatic habitats and limit access to required habitats or block fish migration. The magnitude of these impacts will depend upon the amount and location of water extraction, the density of road construction within watersheds, the number of stream crossings, and the design of the stream crossings.

Under Alternative 4, the impacts on fisheries from water depletions associated with construction would be similar to those discussed under Alternative 1R. As explained in Section 4.13.2, Impacts to Water Resources from Alternative 1R, Applicant proposed Alternative, it is estimated that Alternative 4 would require up to 637 acre-feet of water from the North Platte River during the 4-year construction of the proposed project, with the greatest use (363 acre-feet) occurring during the first year. It is possible that up to 64 acre-feet of the water required for construction would be extracted from the Colorado River watershed (PCW 2010a) with the greatest use (36 acre-feet) occurring during the first year. These amounts are greater than any of the other alternatives. Section 4.13.2, Impacts to Water Resources from Alternative 1R, Applicant proposed Alternative, estimates that this equates to approximately 0.04 percent of the North Platte River's average annual flow near Sinclair and approximately 0.26 percent of the average annual flow of Muddy Creek near Baggs, Wyoming, or 0.05 percent of Savery Creek's average annual flow near Savery, Wyoming. Similar to the other alternatives, this level of depletion would have a major impact to the local fishery and could potentially alter survival of fish in the system through changes such as water temperature, in-stream habitat, and sediment dynamics. This type of impact does not coincide with the management goals for the Upper Muddy Creek Watershed/Grizzly WHMA and Red Rim-Grizzly WHMA for fish and would potentially contribute to the decline of populations. This also may preclude the recovery of BLM sensitive fish species. The level of impact also would depend on the water year. Depletions from the North Platte River would not be allowed to impact current users or interstate agreements through the water rights processes required by the WSEO. At this time the exact locations for water extraction have not been identified, but prior to the Final EIS this information will be determined

and additional analysis for potential impacts to fisheries will be conducted. The potential impacts from increased sedimentation including shifting habitat structure, percent fines in substrates and cover availability was assessed based on the amount of total surface disturbance within sub-watersheds. Under the conceptual design for Alternative 4, the total surface disturbance in the North Platte River-Coal Mine Draw sub-watershed, which contains a statewide important fishery, would be 1.3 percent during construction and 0.3 percent during operations. The total surface disturbance in the Upper Sage Creek-North Platte River sub-watershed, which contains three of the noted fisheries, would be 0.1 percent during construction, and 0.2 percent during operations. The construction percent is the greatest among all the action alternatives, but the operations percent would be similar. Under the conceptual design for Alternative 4, total surface disturbance in the McKinney Creek sub-watershed, which contains the other three noted fisheries plus fisheries associated with the Upper Muddy Creek Watershed/Grizzly WHMA and the Red Rim-Grizzly WHMA,, would be slightly greater than Alternative 1R but less than Alternative 2 both during construction and operation (0.9 percent and 0.2 percent, respectively). None of the surface disturbance in the McKinney Creek sub-watershed would be in the Upper Muddy Creek Watershed/Grizzly WHMA or the Red Rim-Grizzly WHMA (**Figure 4.14-4**). As discussed under Alternative 1R, implementation of BMPs and ACMs would minimize the potential impacts including sedimentation, contamination, and changes in habitat structure resulting from surface disturbance; accidental contamination from construction spills; and construction of access road-stream crossings.

As with Alternative 1R, disruption in fish movement resulting from access road-stream crossings would potentially result in demographic impacts, decreasing population viability. The Alternative 4 conceptual design would result in the greatest number of stream crossings (541) compared to all other alternatives. Similar to Alternatives 2 and 3, a total of five perennial streams would be crossed including; Smith Draw, Iron Springs Draw, Miller Creek, Little Sage Creek, and Sage Creek. However, there would be a total of ten perennial stream crossings, Iron Springs Draw would be crossed four times, and both Smith Draw and Sage Creek would be crossed twice, and all other perennial streams would be crossed only once. Sage Creek is a regionally important trout stream. Similar to all action alternatives conceptual designs, no perennial stream crossings would occur in the McKinney Creek sub-watershed. As discussed in Section 4.13.2, Impacts to Water Resources from Alternative 1R, Applicant proposed Alternative, potential impacts resulting from stream crossings would be minimized through design modifications and placement of structures. The BLM RMP (BLM 2008a) requires that any road crossing any waterbody that potentially supports fish for a portion of the year will be designed to simulate natural stream process, thus allowing fish passage potentially reducing the impacts.

4.14.7 Mitigation and Mitigation Effectiveness

There are two broad categories for mitigation approaches for wildlife, resource maintenance and resource compensation (WGFD 2010). Resource maintenance consists of avoiding, minimizing, rectifying or reducing adverse wildlife impacts through project planning. This approach has been applied through the development of the environmental constraints table, the incorporation of the BMPs and ACMs. Resource compensation involves the development and implementation of measures to replace or provide substitute resources to address impacts, including (as a last resort) financial compensation to be used by the WGFC or another entity for that purpose (WGFD 2010).

A wildlife monitoring and mitigation plan will be developed for the project that should prevent, reduce and detect impacts to wildlife species throughout the life of the project. The wildlife monitoring and mitigation plan will be designed with two purposes. The first purpose will be to provide protocols to monitor wildlife responses, habitats, and behavioral shifts, etc. due to the project. The other purpose will be to provide protocols to protect wildlife species and track the effectiveness of these protections.

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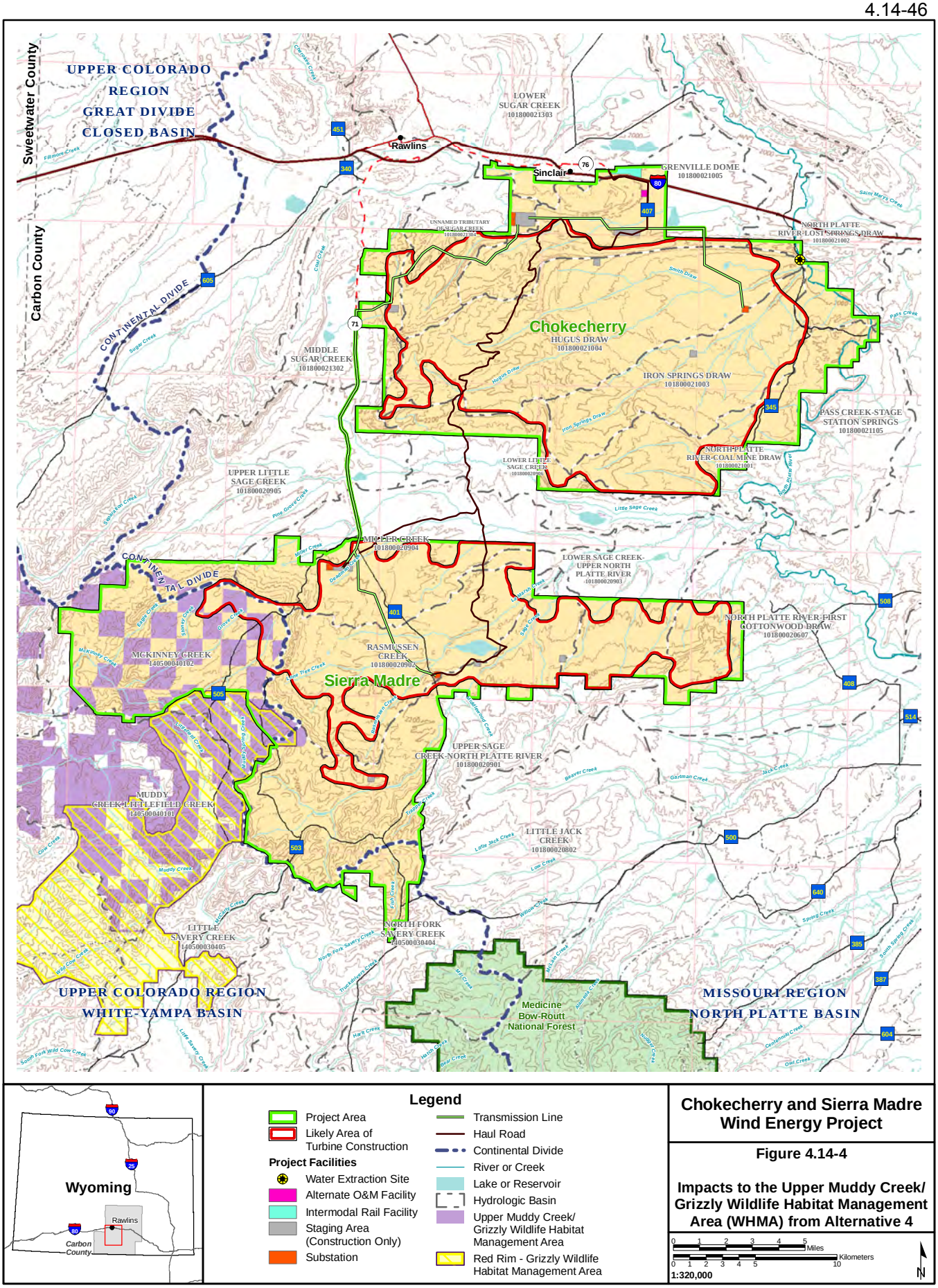

Legend

- Project Area
- Likely Area of Turbine Construction

Project Facilities

- Water Extraction Site
- Alternate O&M Facility
- Intermodal Rail Facility
- Staging Area (Construction Only)
- Substation
- Transmission Line
- Haul Road
- Continental Divide
- River or Creek
- Lake or Reservoir
- Hydrologic Basin
- Upper Muddy Creek/ Grizzly Wildlife Habitat Management Area
- Red Rim - Grizzly Wildlife Habitat Management Area

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.14-4

Impacts to the Upper Muddy Creek/ Grizzly Wildlife Habitat Management Area (WHMA) from Alternative 4

0 1 2 3 4 5 Miles
0 1 2 3 4 5 10 Kilometers
1:320,000
N

GEN-1: The phased construction sequence, as described in Section 2.2, General Project Description, would have a limited affect on reducing the potential impacts for wildlife.

Effectiveness: Concentrating the construction activities in one area during a given year would perhaps reduce the total area avoided by wildlife due to increased human activity during the construction period, but ultimately the entire project would be constructed resulting in the impacts identified in the analysis. As mentioned in the analysis for wildlife species, the magnitude of the potential impacts on most wildlife species would be dependent upon the density and location of infrastructure. The phased construction sequence does not alter the density or location of infrastructure.

Under the phased construction sequence the amount of time between ground disturbance and reclamation activities would be reduced. As discussed in Section 4.13.7, Irreversible and Irretrievable Commitment of Resources, this reduction in time would decrease the amount of time that barren soil is exposed to overland flow events that could potentially cause erosion. Subsequently, the potential impacts from increased erosion and runoff on fish habitat also would likely be reduced. Additionally, the construction of stream crossings would occur over multiple years rather than the first year, allowing the BLM to determine if the BMPs associated with stream crossings are effective for fish management. This would allow the BLM to modify the construction of later stream crossings as applicable.
The presence of workers during construction and maintenance may increase the potential for disturbance and possible poaching of big game. The potential construction of snow fences to maintain the new roads may result in unintentional entrapment of big game. To minimize these potential impacts, the following mitigation measures (WFM-1 and WFM-2) are recommended.

WFM-1: Workers will not be allowed to possess firearms during work activities and will attend mandatory training (provided by WGFD) on wildlife regulations and ways to reduce disturbance to wildlife.

Effectiveness: Discouraging workers from carrying firearms and educating them on wildlife regulations will reduce the risk of poaching and harassment of wildlife.

WFM-2: Snow fences, if used, will be limited to segments of one-quarter mile or less. In addition, escape openings will be provided along roads, every one-quarter mile or less, to facilitate exit of big game animals from snowplowed roads.

Effectiveness: Limiting snow fence length and providing escape openings along roads will reduce the risk of vehicle collisions with big game.

Bat migration occurs through the Application Area from August through September, which could result in an increase in bat mortality during this time period. To minimize the potential increase in bat mortality, the following mitigation measure is recommended.

WFM-3: If measured bat mortality is determined to be above levels of concern for the project (as presented earlier in this section), turbine curtailment would be implemented during low wind speed nights when bats are expected to be migrating through the Application Area (August to September), and perhaps during other time periods if bat mortality is found to be high.

Effectiveness: Turbine curtailment will reduce the risk of bat mortalities when they migrate through the Application Area.

Operation activities would likely result in a significant level of bat mortality. Most bat mortality occurs during low wind speed nights (Arnett et al. 2008). While curtailment is still be evaluated as a method of reducing collision risks for bats, at wind energy facilities where bat mortality is high, curtailment of turbines during these low wind situations has been shown to reduce bat mortality by 50 to 70 percent at

a site in Alberta (Baerwald et al. 2009) and from 53 to 87 percent at one site in Pennsylvania (Arnett et al. 2009). Because most of the bats likely to be impacted by the wind energy facility are not local bats, but long-distance migratory tree bats that breed north of the Application Area, habitat enhancement measures on site would not be productive. To mitigate project-specific bat impacts through habitat enhancements would require habitat enhancements in other parts of the country (e.g., forested areas of the Pacific Northwest, Idaho, and Montana) or even in Canada, which is likely not feasible.

4.14.8 Residual Impacts

Even with the wildlife mitigation measures effectively implemented, there will be some residual impacts specifically wildlife mortalities. It is assumed that the reclamation efforts will be successful and thus no residual impact will occur to habitats. However, reclamation involving plant maturity will require a long time period during which time there would be some loss of habitat.

4.14.9 Irreversible and Irretrievable Commitment of Resources

No irreversible commitments are anticipated for Wildlife and Fisheries. Construction and operation of the any action alternatives would lead to the loss of some wildlife and fisheries resources. Native vegetation and wildlife habitat would be removed in order to accommodate the proposed facilities resulting in an irretrievable commitment of resources for the life of the project. However, as discussed in Section 4.11, Impacts to Vegetation, it is anticipated that upon decommissioning of the project with the appropriate measures for soil reclamation the vegetation would grow back. For grass and forbs it is estimated these communities would recover within 5 years of reclamation; for sagebrush shrublands recovery time may be much longer from 20 to 50 years. It is possible that the wildlife habitat lost during the construction could return to pre-project conditions, thus there would not be an irreversible commitment of wildlife habitat.

All of the action alternatives would cause bird and bat mortality primarily through collisions during turbine operations, as well as wildlife mortality primarily through vehicle collisions on roads or during construction activities, which would be an unavoidable adverse impact and an irretrievable commitment of resources.

4.14.10 Relationship between Local Short-term Uses and Long-term Productivity

Habitat for wildlife would be diminished due to both local short-term uses and long-term uses until the reclaimed areas can be restored to a mature vegetation community. As presented in the vegetation section, these temporal losses consist of the lag time it takes to develop to pre construction conditions, generally 5 to 20 years. In some cases, this would require plant community succession from grassland, to shrubland, to woodland, to forest. Construction and operation of any of the alternatives would likely impact the long-term productivity of passerines, including sagebrush obligate species, due to indirect loss of habitat.

4.15 Impacts to Special Status Species

The Application Area includes potential habitat for three species that are listed under ESA including the black footed ferret (endangered), Ute's ladies tresses (threatened), and Colorado butterfly plant (threatened); nine listed ESA species found downstream of the Application Area in the Platte and Colorado River systems. Furthermore, the Application Area contains potential habitat for 30 species considered sensitive by the BLM. Species listed under the ESA or BLM sensitive species that occur within the RFO district and their associated habitats are presented in **Appendix K**.

The analysis of impacts to special status species was influenced by three levels of management considerations and by issues raised during scoping. The management considerations include those contained in the Rawlins RMP, management considerations for species covered by the ESA or the BLM Wyoming Sensitive Species List; and the additional special considerations. BLM's management goals, objectives, and actions for managing for special status species and consumptive uses are listed in **Table 4.15-1** (BLM 2008a).

Additional management considerations and scoping issues specifically addressing special status species also are presented in **Table 4.15-2**.

Table 4.15-1 Relevant Management Considerations for Special Status Species

BLM RMP and ROD – Special Status Species[1]
<u>Management Actions (Endangered, Threatened, Proposed, and Candidate Species)</u> • Formal conferencing and consultation with the USFWS would occur for authorized activities that would potentially affect the habitat for endangered, threatened, proposed, and candidate species within the RMPPA (Appendix 10). • Habitat and species conservation measures for threatened, endangered, candidate, and proposed species are identified in the biological assessment (BLM 2007e) and the biological opinion (BLM 2007f). Both documents would be adhered to for compliance with the ESA and the BLM Wyoming State Director's Sensitive Species List (BLM Manual 6840). Conservation measures would be applied to all surface disturbing and disruptive activities, as appropriate. Appendix 14 lists all reasonable and prudent measures and terms and conditions for threatened and endangered species and conservation measures for proposed and candidate species. Minimize disturbance to vegetation through application of BMPs, mitigation, as appropriate and practical (BLM 2008a, RMP, Appendices 13, 14, 15, and 19), and reclamation practices (BLM 2008a, RMP, Appendix 36). <u>Management Actions (Species Listed on the BLM Wyoming State Directors' Sensitive Species List)</u> • Surface disturbing and disruptive activities that would potentially affect the habitat of Special Status Species would be intensively managed on a case-by-case basis (Appendices 1, 10, and 15). • Surface disturbing and disruptive activities located in potential mountain plover habitat are prohibited during the breeding period of April 10 to July 10 for the protection of breeding and nesting mountain plovers. Additional protection measures would be applied if this area were later determined to be within occupied habitat (Appendix 16). Occupied habitat is defined as areas where broods and adults have been found.

[1] Management goals and objectives for special status species are the same as those described in **Table 4.14-1.**

Table 4.15-2 Relevant Management Considerations and Scoping Issues for Special Status Species

Resource Topic	Management Considerations/Scoping Issues
Black-Footed Ferret and White-Tailed Prairie Dog	Scoping Issues • The EIS should evaluate impacts to white-tailed prairie dog towns which support numerous species of high priority including the mountain plover, burrowing owl, black-footed ferret, and swift fox.
Platte River System Species (whopping crane, interior least tern, piping plover, pallid sturgeon, and western prairie fringed orchid)	Management Considerations • Platte River Recovery Implementation Program (2006) • Wyoming Water Depletions Plan
Colorado River System Species (Colorado pikeminnow, bonytail, humpback chub, and razorback sucker, Colorado River cutthroat trout, roundtail chub, bluehead sucker, and flannelmouth sucker)	Management Considerations • Upper Colorado River Endangered Fish Recovery Program which consists of five elements including provisions of instream flows; habitat development and maintenance; native fish stocking; management of nonnative species and sportfishing; and research, monitoring, and data management. (USFWS 2010b). • The conservation agreement for Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*) in the states of Colorado, Utah, and Wyoming establishes a collaborative and cooperative effort among resources agencies to assures the long-term viability of Colorado River cutthroat trout throughout their historic range (Colorado River Cutthroat Trout [CRCT] Conservation Team 2006a). • Conservation strategy for Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus)* in the States of Colorado, Utah, and Wyoming identifies management for population and habitat monitoring; habitat improvement; non-native species; establishment, maintain and salvage populations; and systematic conservation planning (CRCT Conservation Team 2006b). • The Range Wide Conservation Agreement and Strategy for roundtail chub (*Gila robusta*), bluehead sucker (*Catostomus discobolus*), and flannelmouth sucker (*Catostomus latipinnis*) outlines measures that states can implement and expand upon to ensure the persistence of the three species populations throughout their ranges (UDNR 2006).

Table 4.15-2 Relevant Management Considerations and Scoping Issues for Special Status Species

Resource Topic	Management Considerations/Scoping Issues
Pygmy Rabbit	Scoping Issues • BLM should conserve sensitive species that occur in the Application Area in a manner that contributes to their removal from BLM's sensitive species (e.g., the greater sage-grouse, pygmy rabbit, white-tailed prairie dog, and possibly the burrowing owl). • The Application Area should be surveyed for presence of pygmy rabbit and if documented, the appropriate mitigation should be applied.
Wyoming Pocket Gopher	Scoping Issues • The Application Area should be surveyed for the presence of the Wyoming pocket gopher and if needed, the appropriate mitigation to preserve the habitat should be applied.
Greater Sage-grouse	Management Considerations • Some of the Application Area is designated by the State of Wyoming as being within a greater sage-grouse core breeding area. Wyoming Governor's State EO 2010-4 mandates that "New development or land uses within Core Population Areas should be authorized or conducted only when it can be demonstrated by the state agency that the activity will not cause declines in greater sage-grouse populations." • WGFC position on greater sage-grouse core breeding areas and wind farm siting dated August 5, 2009. Wind farms constructed in Wyoming will require a permit from the Industrial Siting Council. The Commission directed the WGFD to recommend to the Industrial Siting Council that no wind turbines be constructed in a core area without clear demonstration from the project proponent that the activity will not cause a decline in greater sage-grouse populations. • BLM IM No. WY-2010-012 states that Field Offices must analyze, in the site-specific or project-level NEPA documentation, an alternative that limits development (including wind) to one disturbance location per 640 acres in greater sage-grouse core breeding areas. In addition, the IM states that a greater sage-grouse habitat evaluation shall extend, at a minimum, out 11 miles from the project boundary for large-scale proposed actions, including wind energy development. • The WGFD has developed a greater sage-grouse conservation plan that identifies recommended management practices necessary to sustain and perpetuate greater sage-grouse populations across the state (WGFD 2003).
	Scoping Issues • Concern regarding impacts to greater sage-grouse core breeding areas. • Concern regarding impacts to greater sage-grouse leks, nesting and winter habitat. • Concern regarding the effects of habitat fragmentation.

Table 4.15-2 Relevant Management Considerations and Scoping Issues for Special Status Species

Resource Topic	Management Considerations/Scoping Issues
	• Concern regarding the potential effects of noise on greater sage-grouse. • Concern regarding greater sage-grouse avoidance of tall structures (turbines and power lines). • Recommendation for surveys for new or undiscovered leks. • Recommendation for mitigation such as timing restrictions on construction activity.
Mountain Plover	Scoping Issues • Pre-siting surveys of bird habitat use and migration pathways, as well as raptor and mountain plover nesting areas should be conducted prior to determining tower locations and arrays. • Pre-construction surveys should identify prairie dog towns because of their importance to bird species. • BLM should conserve sensitive species that occur in the Application Area in a manner that contributes to their removal from BLM's sensitive species (e.g., the greater sage-grouse, pygmy rabbit, white-tailed prairie dog, and possibly the burrowing owl).

The following criteria were considered in the assessment of impacts to special status species for each alternative and are the same as those contained in the Rawlins RMP (BLM 2008a). Impacts to special status species would be considered significant if any of the following occurs:

1. Substantial loss of habitat function or disruption of life history requirements of a species or population segment that would make them eligible for listing under the ESA;
2. Decreased viability or increased mortality of threatened and endangered, proposed and candidate species, or reduction or alteration of their critical habitats;
3. Management actions that result in substantial disruption or irreplaceable loss of vital and high value habitats, as defined in the WGFD (2004b) Mitigation Policy;
4. Substantial loss of habitat function or disruption of life history requirements of special status species that would preclude improvement of their status; or
5. Actions preclude attainment of conservation goals, as stated in conservation plans and strategies for special status species.

The analysis for all wildlife and fisheries assumed the BLM would continue to manage fish and wildlife habitats in coordination with the WGFD, the USFWS would have jurisdiction over the management of threatened or endangered fish and wildlife populations, and the BLM, in conjunction with WGFD would continue to manage species listed on the BLM Wyoming State Director's Sensitive Species List in accordance with BLM manual 6840. Further assumptions are that the applicant committed measures and the BMPs (**Appendix C**, **Tables C-2** and **C-3**) would be implemented under all alternatives.

4.15.1 Impacts to Special Status Species from the No Action Alternative

Under the No Action Alternative, the proposed project would not be implemented at any scale and the Application Area would exist under current authorizations and land uses (e.g., livestock grazing). Therefore, impacts to special status species associated with development of the project would not occur.

4.15.2 Impacts to Special Status Species from the Alternative 1R, Applicant Proposed Alternative

4.15.2.1 Federally Listed Species

Wyoming Species

Black-footed Ferret

Two legal/regulatory guidelines are applicable to black-footed ferrets, the ESA and the BLM Wyoming State Sensitive Species List. The ESA and the BLM regulation set objectives and management guidelines to restore habitat to conserve, recover, and maintain populations of black-footed ferret. The ESA recovery plan (USFWS 1988) requires: 1) increase the number of captive ferrets to a facility capacity of 200 breeders by 1991, and 2) establish populations, which before breeding, number 1,500 black-footed ferrets in 10 or more populations in the wild. A six-step process has been outlined to reach this objective, beginning with ensuring success of captive breeding, locating reintroduction habitat, finding other populations of ferrets, devising release strategies, managing reintroduced and other populations, and building programs for public support of the recovery effort.

Potential impacts to black-footed ferret from this alternative include: 1) direct loss of habitat resulting from the construction of roads and turbine pads within portions of prairie dog towns present at the site; 2) indirect loss of habitat due to avoidance of human activity, 3) increased traffic on roads and human activity may result in prairie dog, and potentially black-footed ferrets fatalities, and 4) increased human activity may increase the presence of human pets, which potentially could result in the introduction of canine distemper.

Analysis was completed using the results of surveys conducted within the original Application Area (WEST 2008e) and existing data for the area provided by WYNDD in 2008. The geographic extent of potential impacts to black-footed ferret included the Application Area boundaries of each proposed alternative, plus the area occupied by white-tailed prairie dog populations that maybe potentially affected by the project. We assumed that impacts would not occur within USFWS block-cleared portions of the Application Area.

Alternative 1R has the lowest initial (2,105 acres) and long-term (439 acres) direct loss of white-tailed prairie dog habitat. Alternative 1R would construct the least amount (114 miles) new roads within white-tailed prairie dog habitat, which potentially would result in some vehicle collision fatalities of black-footed ferrets and white-tailed prairie dogs.

Alternative 1R is designed for 1,000 turbines and all infrastructure associated with the project would lead to increased human activity on the site. The increased human activity on the site could result in the presence of dogs on site with personnel associated with the project. The presence of dogs could lead to expose the area to canine distemper which is a fatal disease for black-footed ferret.

Surveys for black-footed ferrets would be required before ground disturbing activities within white-tailed prairie dog colonies located in the Bolten Ranch Prairie Dog Complex. The remaining white-tailed prairie dog colonies within the project are in the “block clearance” area, where surveys for black-footed ferrets are not warranted.

Rare Plants

Two plant species listed as threatened under the ESA could occur within the boundaries of the action alternatives, Ute ladies'-tresses and Colorado butterfly plant. The analysis area considered for these plants includes the project boundaries of each of the action alternatives; however, cumulative effects may extend beyond the project boundaries. Potential impacts to these threatened plants are analyzed using predictive models for mapping habitats capable of supporting special-status plant species. Limited surveys were conducted for rare plants (including threatened species and BLM sensitive species) in 2008, primarily in road and power line corridors and pad locations where appropriate habitat was present. No rare plants were found. Surveys were discontinued because final siting of project facilities is not complete and surveying the entire Application Area was not practical. Using the predictive models, this analysis estimates the amount of acreage of potential habitat for each threatened plant that could be impacted by each alternative. This analysis assumed that surveys will be conducted for sensitive plants prior to construction, once final siting of project facilities is complete. Potential impacts to threatened plants could include:

- Direct loss of special-status plants due to infrastructure placement;
- Loss of sensitive/unique habitats or habitats that support special-status plant species due to infrastructure placement; and
- Increase the distribution of existing noxious and invasive weed species within the Application Area and cause the introduction of new weed species due to surface disturbances (e.g., grading) and increased vehicular traffic.

Based on the predictive model of the potential distribution of Ute ladies'-tresses and Colorado butterfly plant (Fertig and Thurston 2003), potential habitat for both of these species is not likely to be found in the analysis area for Alternative 1R, therefore impacts to either species is unlikely. Surveys will be required in appropriate habitat prior to construction once final siting of project facilities is complete to ensure that impacts to these species do not occur. Surveys will occur during flowering or fruiting (whichever is appropriate) for proper identification.

Platte River System Species

Five federally listed species occur downstream of the Application Area within the Platte River system in Nebraska: whooping crane; interior least tern; piping plover; pallid sturgeon; and, western prairie fringed orchid. Though these species exist only downstream of the Application Area, water depletions for dust control and construction may impact stream flows in the Platte River system. The impact from water depletions in stream flows is a function of reduction in USFWS target flows for the whooping crane, interior least tern, and piping plover in central Nebraska and the potential benefits for the pallid sturgeon in the lower Platte River in eastern Nebraska. While these target flows were designed for the habitat of four animal species, depletions in these flows also would result in impacts to the western prairie fringed orchid, a wetland species occupying wet meadows, important whooping crane foraging habitat within the floodplain of the Platte River in central Nebraska. Under the Platte River Recovery Implementation Program, water removed from the Platte River basin greater than 0.1 acre-feet is considered a depletion and jeopardizes the continued existence of these species.

The proposed water sources and amounts necessary for construction and operations for Alternative 1R were provided by PCW (PCW 2010c) and are the basis of this analysis. It is anticipated that the project would require approximately 500 acre-feet of water over the 4-year construction period, including up to 30 acre-feet for dust control. The primary source of this water would be the North Platte River watershed providing 90 to 100 percent of the water supply. It is anticipated that water for construction of the Sierra Madre area would be obtained from existing ground water wells used for agricultural purposes, which are hydrologically connected to the North Platte River. Water needs for construction in the Chokecherry area would likely come from existing surface water rights and hydrologically connected groundwater wells

used in agriculture. All of these sources would require a Temporary Use Agreement from the WSEO. This agreement would temporarily convert the use of agricultural water rights to industrial use. The historic amount, rate, timing and return flows will remain the same, thus this would not be a new demand and there should be not potential for injury to other appropriators. Nevertheless, this change in use would be considered a new water related activity under the Platte River Program and thus the existing depletions would result in a *May Affect, Likely to Adversely Affect* determination, and the BLM would initiate the ESA consultation process. However, because the water is a change in use the Wyoming Depletions Plan will cover this use (i.e., act as the Reasonable and Prudent Alternative) and the USFWS would use the streamlined ESA consultation as described in the plan and nothing more is required.

Colorado River System Species

Four federally endangered species may occur as downstream residents of the Colorado River system: Colorado pikeminnow; bonytail chub humpback chub; and, razorback sucker. Under the Upper Colorado River Basin Endangered Fish Recovery Program any water removed greater than 0.1 acre-feet from the Colorado River basin is considered a depletion and jeopardizes the continued existence of these fish. The removal of less than 0.1 acre-feet is considered de minimus. Tributary water is defined as water that contributes to in-stream flow habitat. Depletion is defined as water that would contribute to the river flow if not intercepted and removed from the system. The BLM retains discretionary authority over individual projects within the Application Area for the purposes of endangered species consultation. If the recovery program is unable to implement the Recovery Implementation Plan in a timely manner or make sufficient progress in recovery of these endangered species, re-initiation of ESA Section 7 consultation may be required so that new reasonable and prudent alternative can be developed. The USFWS has determined that progress made under the Recovery Implementation Plan has been sufficient to merit a waiver of the mitigation fee for depletions of 100 acre-feet per year or less (USFWS 1995b). The proposed water sources and amounts necessary for construction and operations for Alternative 1R were provided by PCW (PCW 2010a,c) and are the basis of this analysis. It is anticipated that up to 10 percent (50 acre-feet) over 4 years, including up to 3 acre-feet for dust control may be used for the project. This use would be considered a depletion and would result in a *May Affect, Likely to Adversely Affect* determination.

4.15.2.2 BLM Sensitive Species

Thirty-one BLM sensitive species were evaluated for potential impacts under the five alternatives, including the No Action Alternative. Analysis for the three BLM sensitive bat species that potentially occur within the Application Area was included in the evaluation for bats in Section 4.14, Impacts to Wildlife and Fisheries Resources. Similarly, most of the BLM sensitive bird species likely to occur within the Application Area including the sagebrush obligate bird species, bald eagle, ferruginous hawk, burrowing owl, and loggerhead shrike were discussed in the bird evaluation in Section 4.14, Impacts to Wildlife and Fisheries Resources. The long-billed curlew, which was not observed during any of the biological surveys, has been recorded within the 1-mile buffer of the Application Area, but these records are not considered to be current observations. The long-billed curlew is a shorebird which is one of the bird groups analyzed in Section 4.14, Impacts to Wildlife and Fisheries Resources.

The following BLM sensitive species were evaluated in this section: pygmy rabbit; white-tailed prairie dog; Wyoming pocket gopher, Columbian sharp-tailed grouse, greater sage-grouse, mountain plover, northern leopard frog, sensitive plants, Colorado River cutthroat trout, roundtail chub, bluehead sucker, and flannelmouth sucker.

The Great Basin spadefoot toad and boreal toad were not observed during any of the biological surveys and there are no records of the Great Basin spadefoot toad within the Application Area according to the WYNDD and the most recent record for the boreal toad in the area was 1947. Information is generally lacking for the Great Basin spadefoot toad and specific data for the boreal toad, therefore the general

analysis conducted in Section 4.14, Impacts to Wildlife and Fisheries Resources, for reptiles and amphibians would be relevant to these species.

Pygmy Rabbit

The distribution of pygmy rabbits is poorly understood but they have been reported within the sagebrush vegetation community within southwestern Wyoming. A predictive model prepared by WYNDD was utilized to assess the potential impacts for the pygmy rabbit.

Potential impacts to pygmy rabbits include: 1) direct loss of habitat, 2) indirect loss of habitat, including displacement due to increased traffic on roads and human activity; and 3) inadvertent mortalities due to increased traffic on roads and human activity. Generally, pygmy rabbits are known to inhabit the big sagebrush (*Artemesia tridentata*) plant community in areas where big sagebrush grows in tall, dense stands. Recent data indicate that they also use low sagebrush plant community as well. However, available habitat mapping does not provide a vegetation type that is distinctive for low sagebrush, thus to assess the direct habitat loss only the Wyoming big sagebrush vegetation type was considered when estimating the total amount of initial and long-term disturbances. For the purpose of assessing direct impact to pygmy rabbit habitats, initial disturbances were treated the same as long-term disturbances due to the length of time it could take before sagebrush has re-established to pre-disturbance levels (20 to 30 years). Due to the limited and conflicting information available about the range of this species, it is difficult to assess the potential indirect impacts and habitat fragmentation. Indirect impacts were assessed through a qualitative approach; that is, indirect impacts were assumed to increase in proportion to the infrastructure present for each alternative. Direct loss from vehicular collision was evaluated based on the length of roads associated with each alternative. Since the predictive model shows the probability of occurrence for pygmy rabbits throughout the Application Area, the total miles of new road construction for each alternative was used for the assessment.

Alternative 1R has the lowest initial (6,803 acres) and long-term (1,550 acres) direct impact to areas identified as having some probability of pygmy rabbit occurrence. Most of the initial and long-term loss (4,956 acres and 1,169 acres, respectively) would occur within areas classified as having a low probability of occurrence according to the WYNDD predictive model (**Table 4.15-3**).

Table 4.15-3 Pygmy Rabbit Probability Model for Alternative 1R

	Low Probability of Occurrence (acres)	Moderate Probability of Occurrence (acres)	High Probability of Occurrence (acres)
Initial Disturbance	4,956	1,392	455
Long- Term Disturbance	1,169	293	88

Alternative 1R has the lowest (862 acres) initial and long-term loss of Wyoming big sagebrush, which is a habitat type preferred by pygmy rabbits. Indirect impacts from the presence of human activity under Alternative 1R would be similar to Alternatives 2 and 3 as each alternative is designed to construct 1,000 turbines and infrastructure associated with the project. Alternative 1R would construct the least amount of new roads (368 miles), which potentially would result in some fatalities of pygmy rabbits through vehicle collisions.

The boundary for the Alternative 1R area would include 10,417 acres of the Upper Muddy Creek Watershed/Grizzly WHMA and 1,285 acres of the Red Rim-Grizzly WHMA. Management objectives for these areas do not specifically address black-footed ferrets; thus the inclusion of the WHMA within

Alternative 1R boundary would not result in any indirect impacts beyond what has been described. Furthermore, suitable habitat for black-footed ferrets does not occur within either WHMA.

White-tailed Prairie Dog

Potential impacts to white-tailed prairie dogs include: 1) direct loss of habitat, 2) indirect loss of habitat, and 3) increased traffic on roads and human activity potentially resulting in prairie dog fatalities. Analysis was completed using the results of surveys conducted within the original Application Area (WEST 2008e) and existing data for the area provided by WYNDD in 2008. To assess potential direct impacts to white-tailed prairie dog habitat, the white-tailed prairie dog towns delineated through the surveys conducted in 2008 and WYNDD data were overlaid onto the potential disturbance zones for each alternative. Acres of direct disturbance were then calculated. Indirect impacts were assessed through a qualitative approach; that is, indirect impacts were assumed to increase in proportion to the infrastructure present for each alternative. The potential for white-tailed prairie dog fatalities from vehicle collisions was evaluated by calculating the number of miles of new road construction among alternatives.

Alternative 1R has the lowest direct loss (2,105 acres of initial disturbance and 439 acres of long-term disturbance) of white-tailed prairie dog habitat. Indirect impacts from the presence of human activity under Alternative 1R would be similar to Alternatives 2 and 3 as each alternative is designed to construct 1,000 turbines and infrastructure associated with the project. Alternative 1R would construct the least amount of new roads (114 miles) within potential white-tailed prairie dog habitat; however, the road construction potentially would result in some fatalities of white-tailed prairie dogs through vehicle collisions.

Wyoming Pocket Gopher

Information regarding the Wyoming pocket gopher is limited and its distribution is poorly understood. However, suitable habitat is found throughout the Application Area. A predictive model prepared by WYNDD was utilized to identify habitat and assess the potential impacts for this species.

The potential impacts to Wyoming pocket gopher include: 1) direct loss of habitat; 2) indirect loss of habitat; and 3) increased traffic on roads and human activity resulting in Wyoming pocket gopher fatalities. The Wyoming pocket gopher is more of a habitat specialist occurring predominantly on flatter slopes where Gardner's saltbush and winterfat are present and big sagebrush is absent or subdominant (Griscom et al. 2010). Therefore to assess the direct habitat loss, only the vegetation types with Gardner's saltbush and winterfat were considered. For the purpose of assessing direct impacts, initial disturbances were treated the same as long-term disturbances due to the length of time it could take before Gardner's saltbush has re-established to pre-disturbance levels (20 to 30 years). Due to the limited and conflicting information available about the range of this species, it is difficult to assess the potential indirect impacts and habitat fragmentation. Indirect impacts were assessed through a qualitative approach; that is, indirect impacts were assumed to increase in proportion to the infrastructure present for each alternative. Fatalities from vehicular collision were evaluated based on the length of roads associated with each alternative. Since the predictive model shows the probability of occurrence for Wyoming pocket gopher throughout the Application Area, the total miles of new road construction for each alternative was used for the assessment.

Although pocket gopher activity is easy to identify in the field, it is difficult to know which species occupies a particular site without labor-intensive trapping. Two models exist that can aid in calculating the probability that Wyoming pocket gopher occupies a specific site. The first model is based on the average diameter of gopher tunnels within a specific area. Generally, tunnels less than 55 mm in diameter are probably occupied by the Wyoming pocket gopher, and those over 80 mm are probably occupied by the northern pocket gopher. The second model has higher predictive capability and is based on tunnel diameter, litter cover, and Gardner's saltbush cover (Griscom et al. 2010).

To protect potential Wyoming pocket gopher habitat, prior to any surface disturbance, a presence/absence survey for active pocket gopher mounds will be conducted in all potential habitat within the area proposed for surface disturbance. Surveys are to be performed by a wildlife biologist familiar with pocket gopher life history and their associated habitat. If evidence of pocket gophers is found during the preconstruction survey, then additional stipulations may apply (BLM 2009d).

Alternative 1R has the lowest initial (6,803 acres) and long-term (1,551 acres) direct impact to areas identified as having some probability of Wyoming pocket gopher occurrence. Most of the initial and long-term loss (4,339 acres and 867 acres, respectively) would occur in areas classified as having a high probability of occurrence according to the WYNDD predictive model (**Table 4.15-4**).

Table 4.15-4 Wyoming Pocket Gopher Probability Model for Alternative 1R

	Absent (acres)	Absent (Marginal) of Occurrence (acres)	Moderate Probability of Occurrence (acres)	High Probability of Occurrence (acres)
Initial Disturbance	0.04	52	2,412	4,339
Long-Term Disturbance	0.00	11	673	867

Alternative 1R has the second lowest (758 acres) initial and long-term loss of habitat, Gardner's saltbush and winterfat, which is the preferred habitat for Wyoming pocket gophers. Indirect impacts from the presence of human activity under Alternative 1R would be similar to Alternatives 2 and 3 as each alternative is designed to construct 1,000 turbines and infrastructure associated with the project. Alternative 1R would construct the least amount of new roads (368 miles) which potentially would result in some fatalities of Wyoming pocket gophers through vehicle collisions.

Columbian Sharp-tailed Grouse

Potential impacts to Columbian sharp-tailed grouse include disturbance during courtship and breeding periods, the loss of nesting and brood-rearing habitat, and mortality from turbines and vehicle collisions. According to the environmental constraints table (refer to Chapter 2.0) the following protective measures apply to areas within a 0.25-mile of the perimeter of an occupied or known Columbian sharp-tailed grouse lek with undetermined occupancy: 1) high-profile structures (e.g., buildings, storage tanks, overhead power lines, wind turbines, towers, windmills) would be authorized on a case-by-case basis from 0.25 mile to 1 mile of an occupied sharp-tailed grouse lek; and 2) surface disturbing activities or occupancy are prohibited during the hours of 6:00 p.m. to 9:00 a.m. between March 1 to May 20. As used in other NEPA analyses (e.g., BLM 2006), potential nesting and brood-rearing habitat for Columbian sharp-tailed grouse are considered to be within 1 mile of an occupied lek. Because of a lack of research, it is not possible to predict the level of impact potentially associated with each alternative. However, it can reasonably be assumed that risk of collision mortality and habitat impacts would be the greatest for those alternatives that have the largest number of turbines and/or the greatest length of roads.

No Columbian sharp-tailed grouse or leks were documented during avian or greater sage-grouse surveys conducted within the Application Area; however, WYNDD data documents an observation greater than 6 miles away from the boundary of the Application Area. This observation recorded 14 adults during a classification survey conducted in 2002 at documented lek sites. The 0.25-mile perimeter of this lek does not overlap with any alternative; therefore, this lek or associated nesting and brood-rearing habitat would not likely be affected by any action alternative. Therefore, it is anticipated that Alternative 1R would have no impact on Columbian sharp-tailed grouse.

Greater Sage-grouse

Because of their sensitivity and public and agency concern, potential impacts to greater sage-grouse are assessed in detail. Impacts of wind energy facilities to greater sage-grouse can be grouped into two main categories: direct and indirect. Direct impacts include mortality when greater sage-grouse collide with turbines, power lines or meteorological towers, or their supporting infrastructure, such as guy wires. Other direct impacts may include vehicle collisions and increased levels of poaching. Indirect impacts can include the following:

- The presence of wind energy structures may reduce the value and use of otherwise suitable greater sage-grouse habitats if greater sage-grouse avoid tall structures or increased human activity within the wind energy development.
- Wind energy facilities may fragment greater sage-grouse habitat if movement among blocks of grouse habitat is blocked by avoidance of habitats near wind energy facility structures such as wind turbines and power lines.
- Increased predation and harassment of greater sage-grouse that can occur when power lines provide additional perch locations for raptors and corvids or when turbine and power line access roads increase mammalian predator densities.
- Ground disturbance associated with access roads and other construction activities may lead to establishment of noxious weeds or enhanced rates of predation that degrade greater sage-grouse habitats or directly impact populations.
- Access roads associated with wind turbines and power lines may result in increased human use and disturbance of greater sage-grouse in areas previously inaccessible by vehicles, and may increase the chance for fires.

Because of a lack of research, it is not possible to predict the level of direct mortality potentially associated with each alternative. Healthy bird populations, including upland gamebirds, can generally withstand loss of individuals resulting from collision mortality without population level declines (Johnson and Erickson 2010). Although it is not possible to quantify impacts associated with each alternative, it can reasonably be assumed that those alternatives that have the largest number of turbines, affect the greatest amount of greater sage-grouse habitat or that have the greatest length of roads also would likely have the highest level of collision mortality and other direct impacts.

To provide a basis for the greater sage-grouse impact assessment, an extensive literature review was conducted on greater sage-grouse response to wind energy development and power lines. This literature review was not conducted specifically for the CCSM project, but borrowed extensively from recent literature reviews on greater sage-grouse and wind energy (Johnson and Holloran 2010) and effects of power lines on greater sage-grouse prepared for the DEIS for the Mountain States Transmission Intertie project in Montana and Idaho (Johnson 2009).

Based on an extensive literature review of greater sage-grouse response to wind energy facilities and power lines observed or measured greater sage-grouse responses to wind energy structures and transmission lines vary greatly. Impacts range from no apparent or low impacts to one study in California that concluded population impacts may occur out to 3 miles from transmission lines, and impacts to leks have been noted out to 5 miles from transmission lines. Because the sphere of potential influence is not known for wind energy structures and is not consistent among studies of power lines, several recommendations on appropriate buffers to protect greater sage-grouse have been provided. Braun (1998) reported that power lines may limit greater sage-grouse use within 0.6 mile of the line, while Connelly et al. (2000) recommended that power lines not be constructed within 2 miles of seasonal greater sage-grouse habitats. In the Idaho Greater sage-grouse Conservation Plan (2006), it was recommended that a 3-mile buffer be applied on each side of power lines to account for potential influences of avian predation.

Due to a lack of data, there is no consensus on how far wind turbines and power lines may influence greater sage-grouse use of habitat. However, studies of oil and gas development indicate that impacts may occur as far as 4 miles from the disturbance (Naugle et al. 2009). Therefore, the buffer evaluated as being within the potential zone of influence of the wind energy facility structures was 4 miles. Because greater sage-grouse response to wind turbines and power lines may be different, we examined acres of affected habitat within 4 miles separately for wind turbines and power lines. For any area within the 4-mile buffer of both wind turbines and power lines, it was classified as a wind turbine buffer. The acreage of greater sage-grouse habitat affected only by power lines was classified as a power line buffer. It was assumed that greater sage-grouse habitats over 4 miles from the wind energy structures and transmission lines would not be affected. For comparing the various alternatives in terms of their indirect impact to greater sage-grouse habitat, potential impacts to greater sage-grouse habitats in relation to their distance from project infrastructure were categorized as very high (0 to 0.5 mile), high (0.5 to 1 mile), moderate (1 to 2 miles), moderate-low (2 to 3 miles), and low (3 to 4 miles). Although there is not sufficient data to determine exactly how far wind energy facility structures may influence greater sage-grouse habitats, use of the categories described above provide a sound framework for comparing greater sage-grouse impacts among the alternatives.

Habitat mapping used for the impact analysis included maps of occupied greater sage-grouse habitat and greater sage-grouse core breeding areas mapped by the WGFD. Greater sage-grouse core breeding areas include areas with the highest densities of breeding greater sage-grouse in the state, as well as identified winter habitat and areas important for connectivity between populations. The core population areas include roughly 25 percent of the state but contain 83.1 percent of the greater sage-grouse population in the state. Virtually the entire Application Area is classified as greater sage-grouse habitat, either core or non-core. Because research has shown that lek size and persistence may be affected by wind energy structures, the number of greater sage-grouse leks present near each alternative based on mapped locations provided by the WGFD and surveys conducted by WEST (2009a, 2008c) also were evaluated.

Assumptions for the analysis included the following:

- Indirect impacts to greater sage-grouse are highest within 1 mile of project facilities, and do not extend beyond 4 miles from project facilities;
- For the purpose of assessing direct impact to greater sage-grouse habitats, initial disturbances were treated the same as long-term disturbances due to the length of time it could take before sagebrush has re-established to pre-disturbance levels on initially disturbed sites, which could be nearly as long as or as long as the life of the project (20 to 30 years);
- The proportion of the entire Application Area disturbed would be related to the potential for greater sage-grouse impacts;
- Direct impacts related to vehicle collisions, increased poaching and harassment were considered to be directly related to the length of new permanent roads;
- Direct impacts (e.g., collisions) as well as indirect impacts associated with new above-ground power lines would be related to the length of new above-ground power lines associated with each alternative; and
- Direct impacts (i.e., collision mortality) would be directly related to the number of wind turbines.

Alternative 1R entails constructing 1,000 wind turbines, of which 923 would be in greater sage-grouse habitat (**Figure 4.15-1**). For the purposes of assessing impacts to greater sage-grouse habitat, initial disturbance was treated the same as long-term disturbance due to the length of time it could take before sagebrush becomes re-established to pre-disturbance levels (20 to 30 years). Due to the placement of the turbines outside of the core areas, there are no direct impacts to greater sage-grouse core breeding

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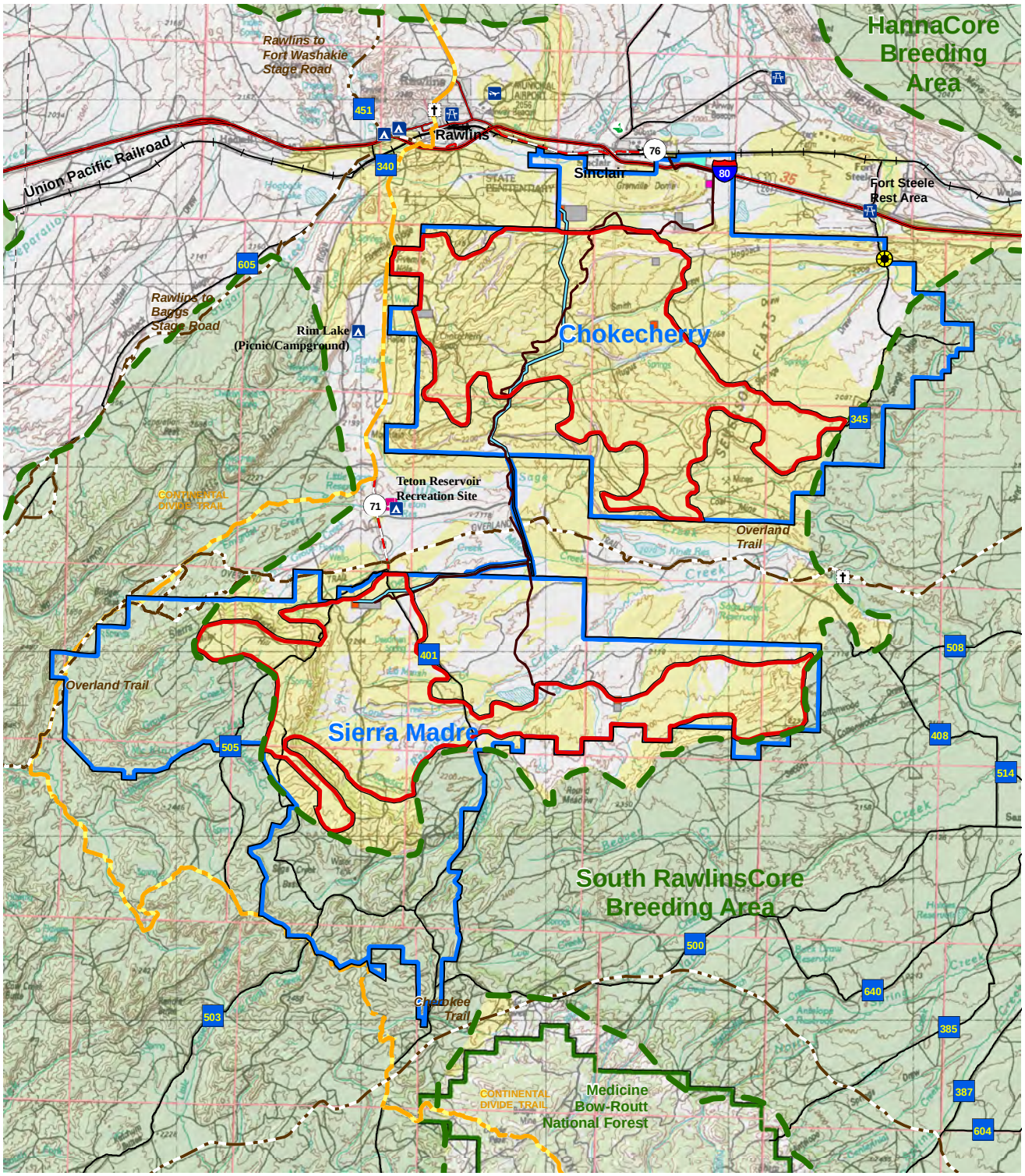

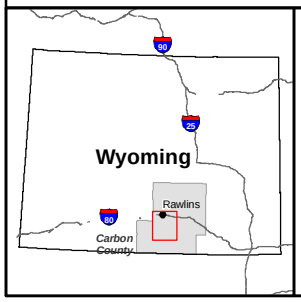

Legend

- Transmission Line
- Haul Road
- Project Area
- Likely Area of Turbine Construction
- Sage Grouse Core Breeding Area
- Sage Grouse Nesting/ Brooding Habitat

Project Facilities

- Water Extraction Site
- Alternate O&M Facility
- Intermodal Rail Facility
- Staging Area (Construction Only)
- Substation
- National Forest

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.15-1

Location of Project Infrastructure associated with Alt. 1R in relation to Greater Sage-grouse Habitat

0 1 2 4 Miles
0 2 4 8 Kilometers
1:320,000
N

areas associated with Alternative 1R. For non-core habitat, the lowest direct impacts are associated with Alternative 1R (6,865 acres; **Table 4.15-5**). Under Alternative 1R, direct disturbances (initial and long-term) would occur to 4.7 percent of the Alternative 1R area. Based on the miles of new road required to construct and maintain the project, Alternative 1R has the lowest potential for impact, with 368 miles of new roads and 179 miles of new aboveground power line.

Alternative 1R has the second most amount of greater sage-grouse core breeding areas within 0.5 mile of project infrastructure (**Table 4.15-6**), which includes turbines and above-ground power lines (4,176 acres). However, this alternative also has the least amount of non-core habitat within 0.5 mile (104,868 acres). Within 4 miles of project infrastructure, Alternative 1R has 121,056 acres of core and 253,015 acres of non-core habitat, or 374,071 acres of greater sage-grouse habitat. Alternative 1R has 17 greater sage-grouse leks present within 1 mile of project infrastructure (**Tables 4.15-6** and **4.15-7**).

Because greater sage-grouse core habitat is considered the most important habitat in the Application Area, and because the number of leks is highly correlated with presence of core area habitat, we ranked the potential impact on greater sage-grouse for each of the four alternatives based on how many acres of greater sage-grouse core habitat was present within 1 mile of wind turbines and power lines combined, as we assumed that the highest potential for indirect impacts would occur within 1 mile of project facilities. Based on this ranking, Alternative 1R had the second highest potential impact, with 13,730 acres of core greater sage-grouse habitat present within 1 mile of project infrastructure (**Tables 4.15-6** and **4.15-7**). The long-term loss of substantial amounts of sagebrush in both core and non-core areas, combined with expansive areas of potential indirect impacts during construction and operation of the facility, would result in habitat loss and disturbance levels exceeding all five significance criteria.

The boundary for the Alternative 1R area would include 10,417 acres of the Upper Muddy Creek Watershed/Grizzly WHMA and 1,285 acres of the Red Rim-Grizzly WHMA. Based on PCW's ACM to not site facilities within greater sage-grouse core breeding areas (**Appendix C**, **Table C-2**), only a small percentage (5.7 percent; or 3,421 acres) of the total upper Muddy Creek Watershed/Grizzly WHMA and (2.7 percent; or 1,038 acres) of the total Red Rim-Grizzly WHMA would potentially be impacted by construction of the project. It is not likely that the inclusion of this area would result in any indirect impacts to the greater sage grouse beyond what has been described above.

Mountain Plover

Potential impacts to mountain plover include disturbance during breeding periods, the loss of nesting and brood-rearing habitat, and mortality from turbines and vehicle collisions. According to the environmental constraints table (**Appendix C**, **Table C-1**) the following protective measures apply to mountain plovers located on BLM lands: 1) habitat will be avoided where practical, 2) all surface-disturbing activities will be restricted from April 10 to July 10, and 3) additional protection measures will be applied if the area is determined to be within occupied habitat. Because of a lack of research, it is not possible to predict the level of direct mortality potentially associated with each alternative. However, it can reasonably be assumed that those alternatives that have the greatest length of roads also would likely have the highest level of collision mortality and other direct impacts.

Habitat mapping for mountain plovers within a portion of the Application Area was conducted in 2008 (WEST 2008d). During these surveys 37 mountain plovers were identified within the Chokecherry area and a total of 7,056 acres suitable habitat for mountain plovers were identified within the Application Area. However, the surveys did not encompass the entire Application Area therefore the analysis for direct impacts to potential habitat was conducted utilizing the vegetation map presented in Section 4.11, Impacts to Vegetation. Direct impacts were evaluated by overlaying the potential disturbance zone over the vegetation map to determine the number of acres impacted both initial and long-term for each alternative. The vegetation types considered potential habitat for mountain plovers are presented in **Table 4.15-8**.

Table 4.15-5 Direct Disturbance Impacts (acres) to Greater Sage-grouse Core and Non-core Habitat by Alternative

Alternative	Disturbance Type	Core Area Habitat	Non-Core Habitat	Total Greater Sage-grouse Habitat
1R	Initial and Long-term	0	6,865	6,865
2	Initial and Long-term	0	7,937	7,937
3	Initial and Long-term	0	7,827	7,827
4	Initial and Long-term	0	7,992	7,992

Table 4.15-6 Acres of Greater Sage-grouse Habitat and Numbers of Greater Sage-grouse Leks within Varying Distances (miles) of Wind Turbines by Alternative

Alternative	Greater Sage-grouse Core Habitat					
	0 – 0.5	0.5 – 1	1 – 2	2 – 3	3 – 4	Total (0 – 4)
1R	4,176	9,554	27,076	35,349	44,901	121,056
2	4,194	9,314	25,315	33,012	42,583	114,418
3	2,577	6,659	18,060	25,408	36,862	89,566
4	3,585	10,701	29,374	38,002	44,793	126,455
No Action	0	0	0	0	0	0
	Greater Sage-grouse Non-core Habitat					
1R	104,868	33,445	49,570	42,696	22,436	253,015
2	119,882	37,255	52,017	42,458	21,901	273,513
3	119,967	35,471	53,832	41,906	21,622	272,798
4	137,628	39,019	46,899	27,879	18,796	270,221
No Action	0	0	0	0	0	0
	Greater Sage-grouse Leks					
1R	3	14	6	5	8	36
2	2	15	3	6	9	35
3	2	14	1	3	7	27
4	9	9	3	6	8	35
No Action	0	0	0	0	0	0

Table 4.15-7 Acres of Greater Sage-grouse Habitat and Numbers of Greater Sage-grouse Leks within Varying Distances (miles) of Transmission Lines (exclusive of 4-Mile Wind Turbine Buffers) by Alternative

Alternative	Greater Sage-grouse Core Habitat					
	0 – 0.5	0.5 – 1	1 – 2	2 – 3	3 – 4	Total (0 – 4)
1R	0	0	0	0	0	0
2	0	0	752	1,943	3,427	6,122
3	0	0	317	1,908	3,492	5,717
4	0	0	0	1,375	5,171	6,546
No Action	0	0	0	0	0	0
	Greater Sage-grouse Non-core Habitat					
1R	0	0	0	0	1,565	1,565
2	0	0	0	0	4,254	4,254
3	0	0	0	0	4,254	4,254
4	0	0	0	0	4,254	4,254
No Action	0	0	0	0	0	0
	Greater Sage-grouse Leks					
1R	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
No Action	0	0	0	0	0	0

Table 4.15-8 Vegetation Types Considered Potential Habitat for Mountain Plover

Grassland	Saltbush
Grassland/Bird's Foot Sagebrush	Saltbush/Goldenweed
Grassland/Mountain Big Sagebrush	Saltbush/Mountain Big Sagebrush/Spiny Horsebrush
Grassland/Saltbush	Saltbush/Spiny Horsebrush
Grassland/Wyoming Big Sagebrush	

Assumptions for the analysis included the following:

- For estimating impacts to mountain plover through loss of habitat, we assumed that the total acreage of initial and long-term impacts associated with each alternative are correlated with mountain plover impacts.
- Direct impacts related to vehicle collisions as well as indirect impacts associated with vehicle disturbance were considered to be directly related to the length of new permanent road.

To protect potential mountain plover habitat, prior to any surface disturbance, a presence/absence survey for active mountain plover nests will be conducted in all potential habitat within the area proposed for surface disturbance. Surveys are to be performed by a wildlife biologist familiar with mountain plover and their associated habitat. If evidence of mountain plovers is found during the preconstruction survey, then additional stipulations may apply (BLM 2009a).

Alternative 1R has the lowest initial and long-term direct impacts (1,606 acres and 208 acres, respectively) to mountain plover habitat. The environmental constraints discussed in Section 2.2, Elements Common to All Alternatives, under mountain plover (avoidance, seasonal stipulations, and additional protective measures) and presented in **Appendix C**, **Table C -1** would be adhered to on BLM land. Because mountain plover habitat consists primarily of grass species, it is anticipated that the initial impacts would recover quickly, assuming adequate precipitation follows the disturbance.

Indirect impacts from the presence of human activity under Alternative 1R would be similar to Alternatives 2 and 3 as each alternative is designed to construct 1,000 turbines and infrastructure associated with the project. Alternative 1R would construct the least amount of new roads within mountain plover habitat (14 miles) which potentially would result in some fatalities of mountain plovers through vehicle collisions.

Prior to any surface disturbance, site-specific surveys will be required to accurately assess potential impacts to mountain plovers.

Northern Leopard Frog

There are three habitat types to consider for the northern leopard frog: breeding and tadpole habitat, adult upland habitat, and overwintering sites (Smith and Keinath 2004). Breeding and tadpole habitat in Wyoming generally consists of ponds that are less than 12 acres and have extensive cattail margins. The adult upland habitat is characterized as herbaceous grasslands (NatureServe 2010; Smith and Keinath 2004) and adults are known to move as far as 5.2 km from the breeding pond (Smith and Keinath 2004). Overwintering sites consist of under water in ponds, streams and rivers. Potential impacts to this species include: 1) direct habitat loss, 2) habitat alteration, and 3) inadvertent mortalities from vehicle collisions.

To assess potential direct impacts to breeding and upland habitats, ponds less than 12 acres that occur within grassland vegetation types were identified and a buffer of 3.2 miles was applied. Then the initial and long-term potential disturbance zone for each alternative was overlaid and the number of potentially affected acres calculated. Potential affects resulting from habitat alteration would be related to degradation of surface waters, which was analyzed in Section 4.13, Impacts to Water Resources. Fatalities from vehicular collision were evaluated based on the length of roads associated with each alternative within the 3.2 miles buffer.

Assumptions for this analysis included the following:

- Northern leopard frog habitat consists of ponds less than 12 acres within grassland habitats;
- Habitats included in the analysis were the grassland vegetation types and wet meadow identified in the map prepared for the vegetation analysis; and
- Direct impacts related to vehicle collisions were considered to be directly related to the length of new roads.

Alternative 1R potentially would impact eight ponds initially and three ponds long-term that are considered suitable habitat for northern leopard frogs, based on pond size and located within a grassland habitat. Alternative 1R has the lowest initial and long-term direct impacts (6,285 acres and 1,472 acres, respectively) on northern leopard frog upland habitat within 3.2 miles of a suitable pond. According to the analysis conducted for general amphibians in Section 4.14, Impacts to Wildlife and Fisheries Resources, potential impacts to the aquatic habitat would result from surface disturbance and possible contamination from construction equipment. Surface disturbance likely would result in increased erosion and runoff causing changes to the quantity and quality of the aquatic habitats. The percent of surface disturbance within a sub-watershed was used as the indicator for the resulting increase in erosion and runoff. Under Alternative 1R, surface disturbance within the sub-watersheds ranged from 0.6 to 1.4 percent during construction phase and 0.1 to 0.3 percent during operation. The application of BMPs and ACMs will minimize the potential impacts resulting from increased erosion and runoff. Potential contamination of the aquatic habitat from construction equipment is not anticipated based on the establishment of the project's SPCC Plan.

New road construction increases the potential for inadvertent mortality through vehicle collision and general disturbance resulting from increased human activity. This alternative would construct the least amount of new roads (348 miles) in upland habitat within 3.2 miles of a suitable pond. Alternative 1R would result in 386 stream crossings resulting in the fragmentation and potential for direct mortalities.

Sensitive Fish. The Colorado River cutthroat trout, roundtail chub, bluehead sucker, and flannelmouth sucker occur within the following sub-watershed basins that have some portion of their drainage within the boundary of Alternative 1R: Little Savery; Muddy Creek-Littlefield Creek; and, McKinney Creek (**Table 3.14-6**). Only a small portion of the Little Savery and Muddy Creek-Littlefield Creek sub-watershed drainages intersect with the Alternative 1R area and no infrastructure would be constructed or stream crossings would occur within these sub-watersheds. As described in Section 4.14.3.5, in Impacts to Wildlife and Fisheries Resources, there would be some surface disturbance and 8 stream crossings within the McKinney Creek sub-watershed. The BLM RMP (BLM 2008a) requires that any road crossing any waterbody that potentially supports fish for a portion of the year will be designed to simulate natural stream process, thus allowing fish passage potentially reducing the impacts. As described in Wildlife and Fisheries, the magnitude of the potential impacts resulting from the stream crossings within McKinney Creek sub-watershed basin cannot be determined without the final layout. The Wildlife and Fisheries section also discusses the potential impacts from Alternative 1R to fisheries within the McKinney sub-watershed. These impacts would be applicable to the BLM sensitive fish species.

Sensitive Plants

Based on the predictive model of the potential distribution of the six BLM sensitive plants (Fertig and Thurston 2003), two species, Cedar Rim thistle and Gibben's beardtongue, are not likely to be found in the analysis area for Alternative 1R, therefore impacts to these species are unlikely.

Persistent sepal yellowcress is most likely to be impacted based on both the predictive model and known occurrence. The model predicts areas of high (421.7 acres), medium (102.8 acres), and low (4.3 acres) probability of potential habitat in the Alternative 1R analysis area that could be disturbed during project

construction. High, medium, and low probability depends on the variables used in the model that are different for each species. Some of the area disturbed during construction would be only initial disturbance; the remainder would be long-term operational impacts. According to the model, 269 acres of high probability potential habitat, 2.57 acres of medium probability potential habitat, and 0.9 acre of low probability potential habitat would be disturbed long-term.

According to the model, one other BLM sensitive plants could be impacted under Alternative 1R, Laramie false sagebrush. During construction, 51.3 acres of medium probability potential habitat for Laramie false sagebrush would be impacted. Of that temporary disturbance, 10.6 acres of medium probability potential habitat for Laramie false sagebrush would be impacted long term during operation of the project.

4.15.3 Impacts to Special Status Species from Alternative 2, Checkerboard Only

Under Alternative 2, the types of impacts on special status species would be similar to Alternative 1R; however, the amount and location of habitat disturbance would differ. The location of infrastructure under Alternative 2 would be compressed into the northern portion of the Sierra Madre area and expanded to the east within the Chokecherry area. Potential impacts from the increase in surface disturbance and the shift in location unique to Alternative 2 are presented below.

4.15.3.1 Federally Listed Species

Wyoming Species

Black-footed Ferret

Potential impacts to black-footed ferret from this alternative include: 1) direct loss of habitat resulting from the construction of roads and turbine pads within portions of prairie dog towns present at the site; 2) indirect loss of habitat due to avoidance of human activity, 3) increased traffic on roads and human activity may result in prairie dog, and potentially black-footed ferrets fatalities, and 4) increased human activity may increase the presence of human pets, which potentially could result in the introduction of canine distemper.

Similar to Alternative 1R, Alternative 2 would result in a initial direct loss of 3,217 acres and a long-term direct loss of 670 acres of white-tailed prairie dog habitat. An estimated 180 miles of new roads would be constructed under Alternative 2 within white-tailed prairie dog towns increasing the potential for wildlife-vehicle collisions. Both the direct loss and road construction impacts are greater than Alternative 1R.

Similar to Alternative 1R, Alternative 2 would construct 1,000 turbines and which would lead to an increase of human activity which could result in the presence of dogs on site with personnel associated with the project. The presence of dogs could lead to expose the area to canine distemper which is a fatal disease for black-footed ferret.

As with Alternative 1R, surveys for black-footed ferrets would be required before ground disturbing activities within white-tailed prairie dog colonies located in the Bolten Ranch Prairie Dog Complex. The remaining white-tailed prairie dog colonies within the project are in the “block clearance” area, where surveys for black-footed ferrets are not warranted.

Rare Plants

Based on the predictive model of the potential distribution of Ute ladies’-tresses and Colorado butterfly plant (Fertig and Thurston 2003), potential habitat for both of these species is not likely to be found in the analysis area for Alternative 2, therefore impacts to either species is unlikely. Surveys will be required in

appropriate habitat prior to construction once final siting of project facilities is complete to ensure that impacts to these species do not occur.

Platte River System Species

Under Alternative 2, impacts associated with water depletions would be the same as discussed for Alternative 1R, although the amount of water used would be 103 acre-feet greater (total of 603 acre-feet) under Alternative 2.

Colorado River System Species

Under Alternative 2, impacts associated with water depletions would be the same as discussed for Alternative 1R, although the amount of water used would be 10 acre-feet greater (total of 60 acre-feet) under Alternative 2.

4.15.3.2 BLM Sensitive Species

Pygmy Rabbit

Potential impacts to pygmy rabbits include: 1) direct loss of habitat, 2) indirect loss of habitat, including displacement due to increased traffic on roads and human activity; and 3) inadvertent mortalities due to increased traffic on roads and human activity.

Alternative 2 would potentially have an initial direct loss of 7,866 acres and long-term loss of 1,779 acres identified as having some probability of pygmy rabbit occurrence. Most of the initial loss (5,960 acres) and long-term loss (1,384 acres) would occur within areas classified as having a low probability of occurrence according to the WYNDD predictive model (**Table 4.15-9**). This loss would be greater than Alternative 1R.

Table 4.15-9 Pygmy Rabbit Probability Model for Alternative 2

	Low Probability of Occurrence (acres)	Moderate Probability of Occurrence (acres)	High Probability of Occurrence (acres)	Very High Probability of Occurrence (acres)
Initial Disturbance	5,960	1,450	456	0.03
Long-term Disturbance	1,384	307	88	0.0

The initial and long-term direct loss of Wyoming big sagebrush, which is a habitat type preferred by pygmy rabbits, would be 978 acres under Alternative 2. Indirect impacts from the presence of human activity under Alternative 2 would be similar to Alternatives 1R and 3 as each alternative is designed to construct 1,000 turbines and infrastructure associated with the project. Indirect impacts may result in reduced populations and species abundance. However, Alternative 2 would construct 477 miles of new roads which is greater than Alternative 1R. The new road construction would potentially result in some fatalities of pygmy rabbits through vehicle collisions. Both the direct loss of habitat and the new road construction would be greater than Alternative 1R.

White-tailed Prairie Dog

Potential impacts to white-tailed prairie dogs include: 1) direct loss of habitat, 2) indirect loss of habitat, and 3) increased traffic on roads and human activity potentially resulting in prairie dog fatalities.

Alternative 2 would have a direct loss of 3,217 acres of initial disturbance and 670 acres of long-term disturbance of white-tailed prairie dog habitat. Indirect impacts from the presence of human activity under

Alternative 2 would be similar to Alternatives 1R and 3 as each alternative is designed to construct 1,000 turbines and infrastructure associated with the project. Indirect impacts may result in reduced populations and species abundance. However, Alternative 2 would construct 180 miles of new roads within potential white-tailed prairie dog habitat, which is greater than Alternative 1R. The new road construction would potentially result in some fatalities of white-tailed prairie dogs through vehicle collisions and increased poaching. Both the loss of habitat and the new road construction would be greater than Alternative 1R.

Wyoming Pocket Gopher

The potential impacts to Wyoming pocket gopher include: 1) direct loss of habitat; 2) indirect loss of habitat; and 3) increased traffic on roads and human activity resulting in Wyoming pocket gopher fatalities.

Alternative 2 would potentially have an initial direct loss of 7,866 acres and long-term loss of 1,779 acres identified as having some probability of Wyoming pocket gopher occurrence. Most of the initial loss (4,713 acres) and long-term loss (963 acres) would occur in areas classified as having a high probability of occurrence according to the WYNDD predictive model (**Table 4.15-10**). Alternative 2 would have a greater direct loss of areas with a high to moderate probability of Wyoming pocket gopher than under Alternative 1R.

Table 4.15-10 Wyoming Pocket Gopher Probability Model for Alternative 2

	Absent (acres)	Absent (Marginal) of Occurrence (acres)	Moderate Probability of Occurrence (acres)	High Probability of Occurrence (acres)
Initial Disturbance	0.9	58	3,094	4,713
Long-term Disturbance	0.2	12	804	963

The initial and long-term direct loss of Gardner's saltbush and winterfat, habitat for Wyoming pocket gophers, would be 749 acres under Alternative 2. Indirect impacts from the presence of human activity under Alternative 2 would be similar to Alternatives 1R and 3 as each alternative is designed to construct 1,000 turbines and infrastructure associated with the project. Indirect impacts may result in reduced populations and species abundance. However, Alternative 2 would construct 477 miles of new roads, which is greater than Alternative 1R. The new road construction would potentially result in some fatalities of Wyoming pocket gophers through vehicle collisions. Both the direct loss of habitat and the new road construction would be greater than Alternative 1R.

Columbian Sharp-tailed Grouse

Similar to Alternative 1R, no Columbian sharp-tailed grouse leks have been documented within the Application Area or within a 1-mile buffer of the Application Area. Therefore, it is anticipated Alternative 2 would not have any impacts on Columbian sharp-tailed grouse.

Greater Sage-grouse

Impacts to greater sage-grouse under Alternative 2 include direct impacts through collisions with wind turbines and power lines, as well as direct loss of habitat due to ground disturbance activities, indirect loss of habitat due to displacement from wind energy facilities, power lines, and habitat fragmentation.

Alternative 2 involves constructing 1,000 wind turbines in the checkerboard portions of the ranch only, all but 106 of which would be located in greater sage-grouse habitat (**Figure 4.15-2**). Similar to Alternative 1R, there would be no direct impacts to greater sage-grouse core breeding areas. Alternative 2 would result in direct impacts to 7,937 acres of non-core habitat (**Table 4.15-4**). Under Alternative 2, direct disturbances (initial and long-term) would occur to 5.3 percent of the Application Area. Alternative 2 would entail construction of 477 miles of new road and 218 miles of new aboveground power line.

Alternative 2 has 4,194 acres of greater sage-grouse core habitat within 0.5 mile of project infrastructure. This alternative also has 119,882 acres of non-core habitat within 0.5 mile. Within 4 miles of project infrastructure, Alternative 2 has 120,540 acres of core and 277,767 acres of non-core habitat, or 398,307 acres of greater sage-grouse habitat (**Tables 4.15-6** and **4.15-7**).

Alternative 2 has 17 greater sage-grouse leks present within 1 mile of project infrastructure (**Table 4.15-6**). There also are 13,508 acres of core habitat present within 1 mile of project infrastructure (**Tables 4.15-6** and **4.15-7**). The long-term loss of substantial amounts of sagebrush in both core and non-core areas, combined with expansive areas of potential indirect impacts during construction and operation of the facility, would result in habitat loss and disturbance levels exceeding all five significance criteria.

Mountain Plover

Potential impacts to mountain plover include direct loss of habitat, disturbance during the breeding period, the loss of nesting and brood-rearing habitat, and mortality from turbines and vehicle collisions.

Alternative 2 would result in the direct loss of approximately 2,044 acres for the initial disturbance and 456 acres for long-term disturbance of mountain plover habitat, which is greater than Alternative 1R. Similar to Alternative 1R, BLM environmental constraints discussed in Section 2.2, General Project Description, and presented in **Appendix C**, **Table C-1** under mountain plover would be adhered to on BLM lands. This alternative would construct the greatest amount (21 miles) of new roads within mountain plover habitat, thus increasing the potential for wildlife-vehicle collisions.

Prior to any surface disturbance, site-specific surveys will be required to accurately assess potential impacts to mountain plovers.

Northern Leopard Frog

Potential impacts to northern leopard frog include direct loss of aquatic and upland habitat, potential degradation of aquatic habitats through erosion and runoff, and mortalities from wildlife-vehicle collisions.

Alternative 2 would potentially impact six ponds initially that are considered suitable habitat for northern leopard frogs, based on pond size and location within a grassland habitat, and only four ponds long-term. Alternative 2 would potentially result in the direct loss of approximately 7,410 acres of initial disturbance and 1,713 acres for long-term disturbance on northern leopard frog upland habitat within 3.2 miles of a suitable pond. According to the analysis general amphibians in Section 4.14, Impacts to Wildlife and Fisheries Resources, potential impacts to the aquatic habitat would result from surface disturbance and possible contamination from construction equipment. Under Alternative 2, surface disturbance within the sub-watersheds would range from 0.8 to 1.3 percent during construction phase and 0.1 to 0.3 percent during operation, which is slightly higher than Alternative 1R. The application of BMPs and ACMs will minimize the potential impacts resulting from increased erosion and runoff. Potential contamination of the aquatic habitat from construction equipment is not anticipated based on the establishment of the project's SPCC Plan.

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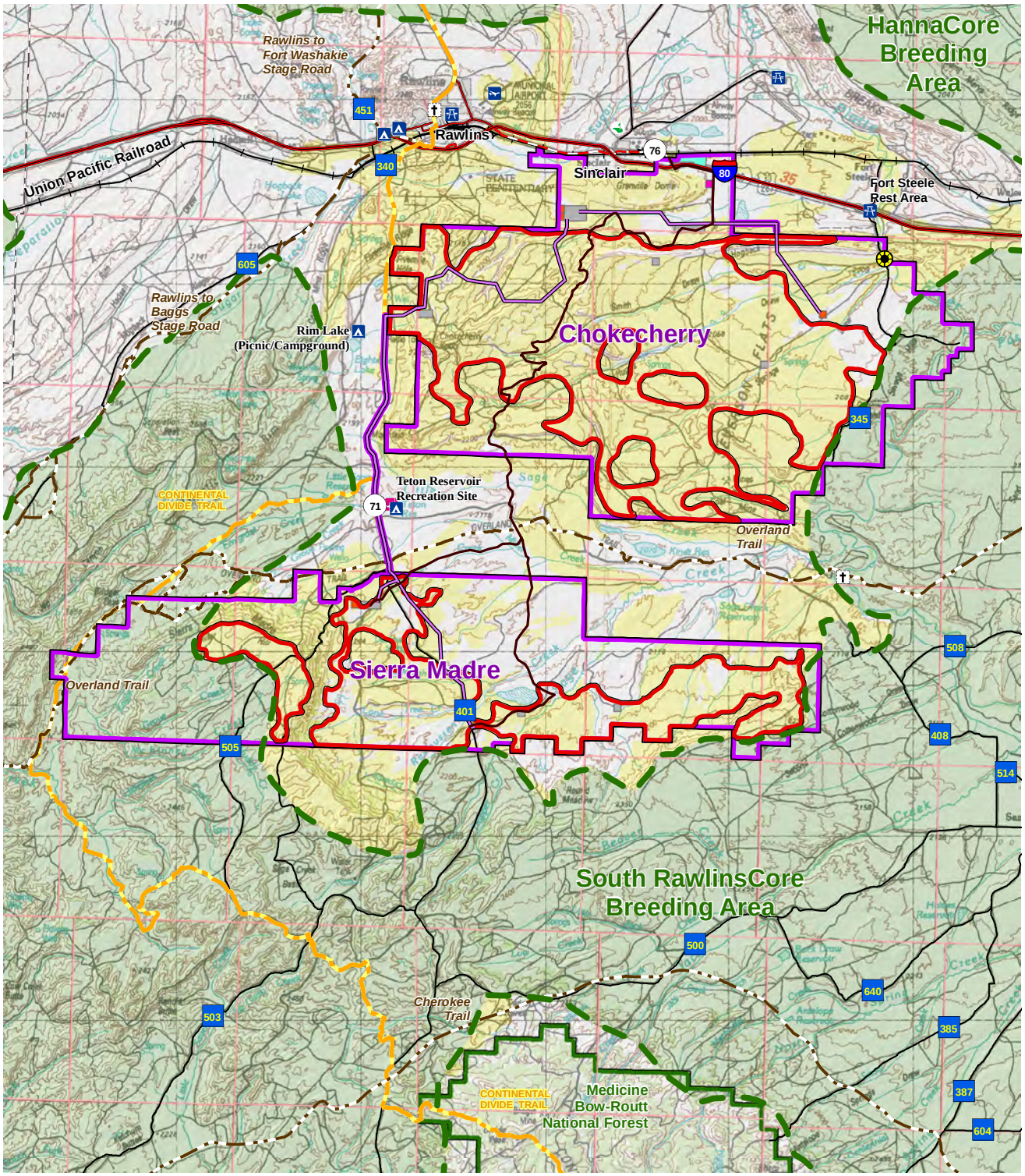

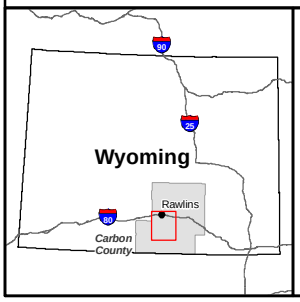

Legend

- Transmission Line
- Haul Road
- Project Area
- Likely Area of Turbine Construction
- Sage Grouse Core Breeding Area
- Sage Grouse Nesting/ Brooding Habitat

Project Facilities

- Water Extraction Site
- Alternate O&M Facility
- Intermodal Rail Facility
- Staging Area (Construction Only)
- Substation
- National Forest

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.15-2

Location of Project Infrastructure associated with Alt. 2 in relation to Greater Sage-grouse Habitat

0 1 2 4 Miles
0 2 4 8 Kilometers
1:320,000
N

New road construction increases the potential for inadvertent mortality through vehicle collision and general disturbance resulting from increased human activity. This alternative would construct 437 miles of new roads in upland habitat within 3.2 miles of a suitable pond. Alternative 2 would result in 465 stream crossings, resulting in habitat fragmentation and the potential for direct mortalities. Both the potential direct habitat loss and the amount of new road construction within the habitat would be greater than Alternative 1R.

Sensitive Fish

The boundary of Alternative 2 does not include any portion of the Little Savery or Muddy Creek-Littlefield Creek sub-watersheds. Although, the a portion of the McKinney Creek sub-watershed is included within the Alternative 2 boundary, under the current conceptual layout no surface disturbance associated with turbine construction would occur but 10 stream crossings would occur within the sub-watershed. The BLM RMP (BLM 2008) requires that any road crossing any waterbody that potentially supports fish for a portion of the year will be designed to simulate natural stream process, thus allowing fish passage potentially reducing the impacts. As described in Section 4.14.4.5 in Impacts to Wildlife and Fisheries Resources, the magnitude of the potential impacts resulting from the stream crossings within McKinney Creek sub-watershed basin cannot be determined without the final layout. The Wildlife and Fisheries section also discusses the potential impacts from Alternative 2 to fisheries within the McKinney sub-watershed.

Sensitive Plants

Based on the predictive model of the potential distribution of the six BLM sensitive plants (Fertig and Thurston 2003), two species, Cedar Rim thistle and Gibben's beardtongue, are not likely to be found in the analysis area for Alternative 2, therefore impacts to these species are unlikely.

Persistent sepal yellowcress is most likely to be impacted based on both the predictive model and known occurrence. The likelihood of impacting potential habitat is higher than under Alternative 1R. The model predicts areas of high (635.2 acres), medium (76.2 acres), and low (7.1 acres) probability of potential habitat in the analysis area that could be disturbed during project construction. High, medium, and low probability depends on the variables used in the model, which vary by species. Some of the area disturbed during construction would be initial disturbance; the remainder would be long-term operational impacts. According to the model, 320.4 acres of high probability potential habitat, 4.6 acres of medium probability potential habitat, and 1.4 acre of low probability potential habitat would be disturbed long-term.

According to the model, one other BLM sensitive plants could be impacted under Alternative 2, Laramie false sagebrush. During construction, 58.5 acres of medium probability potential habitat for Laramie false sagebrush would be impacted. Of that temporary disturbance, 12.4 acres of medium probability potential habitat for Laramie false sagebrush would be impacted long term during operation of the project. As with persistent sepal yellowcress, the likelihood of impacting potential habitat is higher than under Alternative 1R for Laramie false sagebrush.

4.15.4 Impacts to Special Status Species from Alternative 3, No Miller Hill

4.15.4.1 Federally Listed Species

Under Alternative 3 infrastructure would not occur within the Miller Hill or southern portion of Sierra Madre, but would increase construction in the eastern portion of the Sierra Madre area. Development in the Chokecherry area would be the same as Alternative 2. Potential impacts from the increase in surface disturbance and the shift in location unique to Alternative 3 are presented below.

Wyoming Species

Black-footed Ferret

Potential impacts to black-footed ferret from this alternative include: 1) direct loss of habitat resulting from the construction of roads and turbine pads within portions of prairie dog towns present at the site; 2) indirect loss of habitat due to avoidance of human activity, 3) increased traffic on roads and human activity may result in prairie dog, and potentially black-footed ferrets fatalities, and 4) increased human activity may increase the presence of human pets, which potentially could result in the introduction of canine distemper.

Alternative 3 would result in an initial direct loss of 2,833 acres and a long-term direct loss of 570 acres of white-tailed prairie dog habitat. An estimated 156 miles of new roads would be constructed under Alternative 3 within white-tailed prairie dog towns increasing the potential for wildlife-vehicle collisions. Both the direct loss and road construction impacts are greater than Alternative 1R.

Similar to Alternative 1R, Alternative 3 would construct 1,000 turbines and which would lead to an increase of human activity which could result in the presence of dogs on site with personnel associated with the project. The presence of dogs could lead to expose the area to canine distemper which is a fatal disease for black-footed ferret.

As with all action alternatives, surveys for black-footed ferrets would be required before ground disturbing activities within white-tailed prairie dog colonies located in the Bolten Ranch Prairie Dog Complex. The remaining white-tailed prairie dog colonies within the project are in the “block clearance” area, where surveys for black-footed ferrets are not warranted.

Rare Plants

Based on the predictive model of the potential distribution of Ute ladies’-tresses and Colorado butterfly plant (Fertig and Thurston 2003), potential habitat for both of these species is not likely to be found in the analysis area for Alternative 3, therefore impacts to either species is unlikely. Surveys will be required in appropriate habitat prior to construction once final siting of project facilities is complete to ensure that impacts to these species do not occur.

Platte River System Species

Under Alternative 3, impacts associated with water depletions would be the same as discussed for Alternative 1R, although the amount of water used would be 84 acre-feet greater (total of 584 acre-feet) under Alternative 3.

Colorado River System Species

Under Alternative 3, impacts associated with water depletions would be the same as discussed for Alternative 1R, although the amount of water used would be 8 acre-feet greater (total of 48 acre-feet) under Alternative 3.

4.15.4.2 BLM Sensitive Species

Pygmy Rabbit

Potential impacts to pygmy rabbits include: 1) direct loss of habitat, 2) indirect loss of habitat, including displacement due to increased traffic on roads and human activity; and 3) inadvertent mortalities due to increased traffic on roads and human activity.

Alternative 3 would potentially have an initial direct loss of 7,757 acres and long-term direct loss of 1,745 acres identified as having some probability of pygmy rabbit occurrence. Most of the initial and long-term loss (5,703 acres and 1,335 acres, respectively) would occur within areas classified as having

a low probability of occurrence according to the WYNDD predictive model (**Table 4.15-11**). This loss would be greater than Alternative 1R.

Table 4.15-11 Pygmy Rabbit Probability Model for Alternative 3

	Low Probability of Occurrence (acres)	Moderate Probability of Occurrence (acres)	High Probability of Occurrence (acres)	Very High Probability of Occurrence (acres)
Initial Disturbance	5,703	1,595	459	0.03
Long-term Disturbance	1,335	337	73	0.00

The initial and long-term direct loss of Wyoming big sagebrush, which is a habitat type preferred by pygmy rabbits, would be 901 acres under Alternative 3. Indirect impacts from the presence of human activity under Alternative 3 would be similar to Alternatives 1R and 2 as each alternative is designed to construct 1,000 turbines and infrastructure associated with the project. Indirect impacts may result in reduced populations and species abundance. However, Alternative 3 would construct 459 miles of new roads. The new road construction would potentially result in some fatalities of pygmy rabbits through vehicle collisions. Both the direct loss of habitat and the new road construction would be greater than Alternative 1R.

White-tailed Prairie Dog

Potential impacts to white-tailed prairie dogs include: 1) direct loss of habitat, 2) indirect loss of habitat, and 3) increased traffic on roads and human activity potentially resulting in prairie dog fatalities.

Alternative 3 would have a direct loss of 2,833 of initial disturbance and 570 acres of long-term disturbance acres of white-tailed prairie dog habitat. Indirect impacts from the presence of human activity under Alternative 3 would be similar to Alternatives 1R and 2 as each alternative is designed to construct 1,000 turbines and infrastructure associated with the project. Indirect impacts may result in reduced populations and species abundance. However, Alternative 3 would construct 156 miles of new roads within potential white-tailed prairie dog habitat. The new road construction would potentially result in some fatalities of pygmy rabbits through vehicle collisions. Both the loss of habitat and the new road construction would be greater than Alternative 1R.

Wyoming Pocket Gopher

The potential impacts to Wyoming pocket gopher include: 1) direct loss of habitat; 2) indirect loss of habitat; and 3) increased traffic on roads and human activity resulting in Wyoming pocket gopher fatalities.

Alternative 3 would potentially have an initial direct loss of 7,759 acres and long-term loss of 1,740 acres identified as having some probability of Wyoming pocket gopher occurrence. Most of the initial and long-term direct loss (4,465 acres and 901 acres, respectively) would occur in areas classified as having a high probability of occurrence according to the WYNDD predictive model (**Table 4.15-12**). This loss would be greater than Alternative 1R.

Table 4.15-12 Wyoming Pocket Gopher Probability Model for Alternative 3

	Absent (acres)	Absent (Marginal) of Occurrence (acres)	Moderate Probability of Occurrence (acres)	High Probability of Occurrence (acres)
Initial Disturbance	0.2	71	3,223	4,465
Long-term Disturbance	0.1	15	824	901

The initial and long-term direct loss of Gardner's saltbush and winterfat, habitat for Wyoming pocket gophers, would be 767 acres under Alternative 3. Indirect impacts from the presence of human activity under Alternative 3 would be similar to Alternatives 1R and 2 as each alternative is designed to construct 1,000 turbines and infrastructure associated with the project. Indirect impacts may result in reduced populations and species abundance. However, Alternative 3 would construct 459 miles of new roads. The new road construction would potentially result in some fatalities of pygmy rabbits through vehicle collisions. Both the direct loss of habitat and the new road construction would be greater than Alternative 1R.

Columbian Sharp-tailed Grouse

Similar to Alternatives 1R and 2, no Columbian sharp-tailed grouse leks have been documented within the alternative boundaries or within a 1-mile buffer of the Application Area. Therefore, it is anticipated Alternative 3 would not have any impact on Columbian sharp-tailed grouse.

Greater Sage-grouse

Impacts to greater sage-grouse under Alternative 3 include direct impacts through collisions with wind turbines and power lines, as well as direct loss of habitat due to ground disturbance activities, indirect loss of habitat due to displacement from wind energy facilities, power lines, and habitat fragmentation.

Alternative 3 would entail constructing 1,000 wind turbines in the Application Area but excludes placement of project infrastructure in the Miller Hill and southern Sierra Madre area (**Figure 4.15-3**). All but 112 turbines would be located in greater sage-grouse habitat. Similar to Alternatives 1R and 2, Alternative 3 would not result in any direct impacts to greater sage-grouse core breeding areas. However, direct impacts (7,827 acres) would occur in non-core habitat (**Table 4.15-5**). Under Alternative 3, direct disturbances (initial and long-term) would occur to 6.1 percent of the Application Area. Alternative 3 would entail construction of 459 miles of new road and 217 miles of new above-ground power line.

Alternative 3 has 2,577 acres of greater sage-grouse core habitat within 0.5 mile of project infrastructure. This alternative also has 119,967 acres of non-core habitat within 0.5 mile. Within 4 miles of project infrastructure, Alternative 3 has 95,283 acres of core and 277,052 acres of non-core habitat, or 372,335 acres of greater sage-grouse habitat (**Tables 4.15-6** and **4.15-7**).

Alternative 3 has 16 greater sage-grouse leks present within 1 mile of project infrastructure (**Table 4.15-6**). There also are 9,236 acres of core habitat present within 1 mile of project infrastructure (**Tables 4.15-6** and **4.15-7**). The long-term loss of substantial amounts of sagebrush in both core and non-core areas, combined with expansive areas of potential indirect impacts during construction and operation of the facility, would result in habitat loss and disturbance levels exceeding all five significance criteria.

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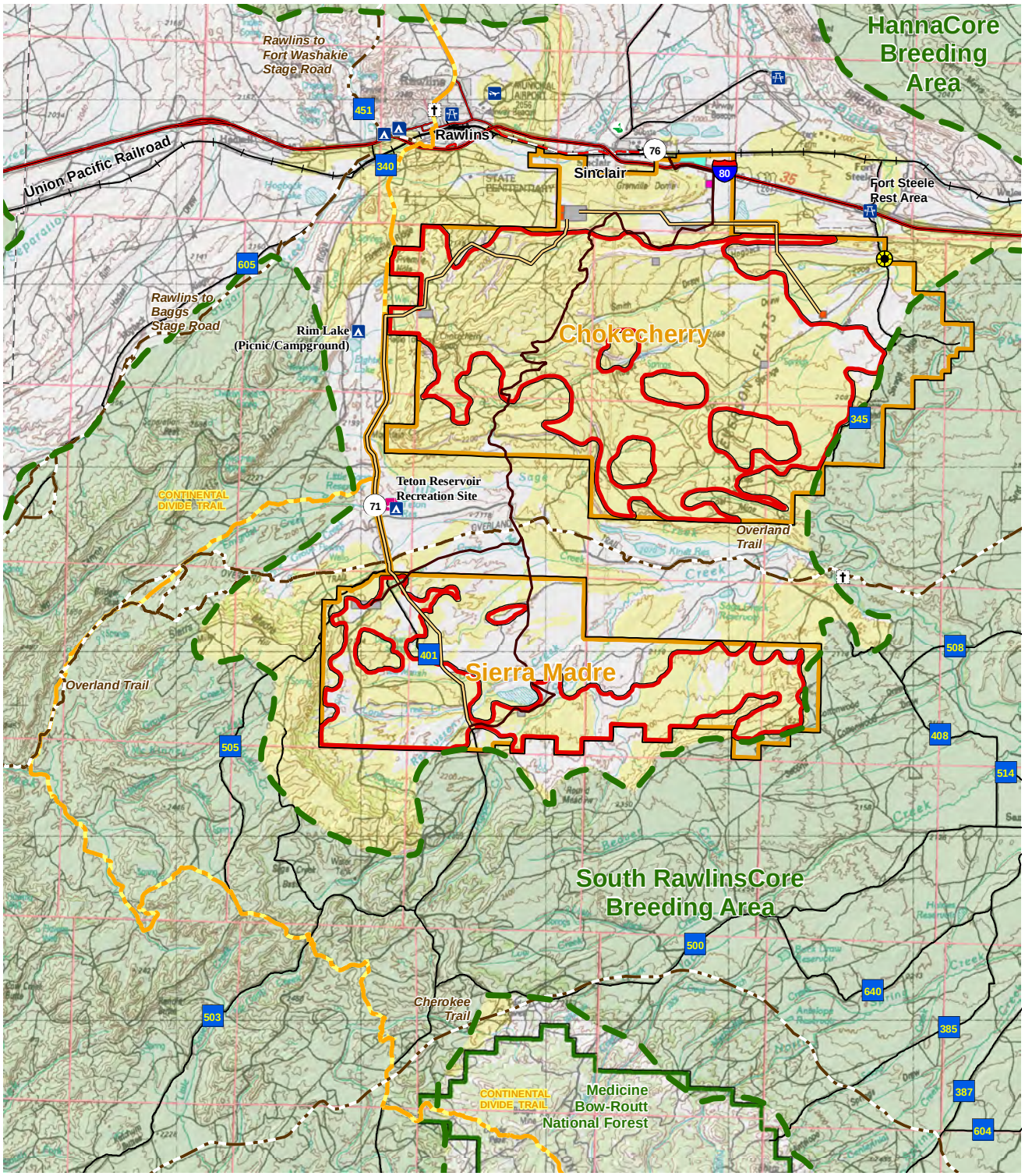

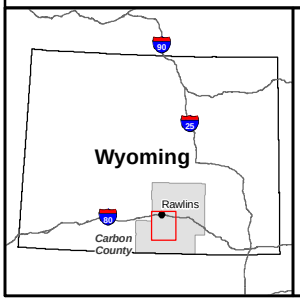

Legend

- Transmission Line
- Haul Road
- Project Area
- Likely Area of Turbine Construction
- Sage Grouse Core Breeding Area
- Sage Grouse Nesting/ Brooding Habitat

Project Facilities

- Water Extraction Site
- Alternate O&M Facility
- Intermodal Rail Facility
- Staging Area (Construction Only)
- Substation
- National Forest

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.15-3

Location of Project Infrastructure associated with Alt. 3 in relation to Greater Sage-grouse Habitat

0 1 2 4 Miles
0 2 4 8 Kilometers
1:320,000
N

Mountain Plover

Potential impacts to mountain plover include direct loss of habitat, disturbance during breeding periods, the loss of nesting and brood-rearing habitat, and mortality from turbines and vehicle collisions.

Alternative 3 would result in the direct loss of approximately 2,215 acres for the initial disturbance and 506 acres for long-term disturbance of mountain plover habitat, which is greater than Alternative 1R. Considering the environmental constraints associated with the BLM land, this loss of habitat would be similar to Alternative 1R. This alternative would construct 18 miles of new roads within mountain plover habitat, thus increasing the potential for wildlife-vehicle collisions.

Prior to any surface disturbance, site-specific surveys will be required to accurately assess potential impacts to mountain plovers.

Northern Leopard Frog

Potential impacts to northern leopard frog include direct loss of aquatic and upland habitat, potential degradation of aquatic habitats through erosion and runoff, and mortalities from wildlife-vehicle collisions.

Alternative 3 would potentially impact the same number of ponds considered suitable habitat for northern leopard frogs as Alternative 2, based on pond size and location within a grassland habitat, both initially and long-term (six and four ponds, respectively). However, Alternative 3 would potentially result in the direct loss of approximately 7,233 acres of initial disturbance and 1,664 acres for long-term disturbance on northern leopard frog upland habitat within 3.2 miles of a suitable pond. According to the analysis general amphibians in Section 4.14, Impacts to Wildlife and Fisheries Resources, potential impacts to the aquatic habitat would result from surface disturbance and possible contamination from construction equipment. Under Alternative 3, surface disturbance within the sub-watersheds would range from 0.8 to 1.2 percent during construction phase and 0.1 to 0.2 percent during operation, which is slightly higher than Alternative 1R. The application of BMPs and ACMs will minimize the potential impacts resulting from increased erosion and runoff. Potential contamination of the aquatic habitat from construction equipment is not anticipated based on the establishment of the project's SPCC Plan.

New road construction increases the potential for inadvertent mortality through vehicle collision and general disturbance resulting from increased human activity. This alternative would construct 426 miles of new roads in upland habitat within 3.2 miles of a suitable pond. Alternative 3 would result in 457 stream crossings, resulting in habitat fragmentation and the potential for direct mortalities. Although the number of suitable ponds affected by this impact was the least, the potential direct habitat loss and the amount of new road construction within the habitat would be greater than Alternative 1R.

Sensitive Fish

The boundary of Alternative 3 does not include any portion of the Little Savery, Muddy Creek-Littlefield Creek, or McKinney Creek sub-watersheds within which BLM sensitive fish species are known to occur. General impacts to the fisheries under Alternative 3 were analyzed in Section 4.14.5.5 in Impacts to Wildlife and Fisheries Resources.

Sensitive Plants

Based on the predictive model of the potential distribution of the six BLM sensitive plants (Fertig and Thurston 2003), two species, Cedar Rim thistle and Gibben's beardtongue, are not likely to be found in the analysis area for Alternative 3, therefore impacts to these species are unlikely.

Persistent sepal yellowcress is most likely to be impacted based on both the predictive model and known occurrence. The likelihood of impacting potential habitat is higher than under Alternative 1R, but nearly the same as Alternative 2. The model predicts areas of high (635.2 acres), medium (76.2 acres), and low

(7.2 acres) probability of potential habitat in the analysis area that could be disturbed during project construction. High, medium, and low probability depends on the variables used in the model, which vary by species. Some of the area disturbed during construction would be initial disturbance; the remainder would be long-term operational impacts. According to the model, 320.4 acres of high probability potential habitat, 4.6 acres of medium probability potential habitat, and 1.4 acres of low probability potential habitat would be disturbed long-term.

According to the model, one other BLM sensitive plants could be impacted under Alternative 3, Laramie false sagebrush. During construction, 69.5 acres of medium probability potential habitat for Laramie false sagebrush would be impacted. Of that initial disturbance, 15.0 acres of medium probability potential habitat for Laramie false sagebrush would be impacted long term during operation of the project. The likelihood of impacting potential habitat is higher than under Alternative 1R for Laramie false sagebrush.

4.15.5 Impacts to Special Status Species from Alternative 4, Private Lands Only

4.15.5.1 Federally Listed Species

The location of infrastructure under Alternative 4 would occur only on private lands, which would result in infrastructure to be constructed throughout most of the Application Area. Potential impacts from the increase in surface disturbance and the expansion throughout the Application Area unique to Alternative 4 are presented below.

Wyoming Species

Black-footed Ferret

Potential impacts to black-footed ferret from this alternative include: 1) direct loss of habitat resulting from the construction of roads and turbine pads within portions of prairie dog towns present at the site; 2) indirect loss of habitat due to avoidance of human activity; 3) increased traffic on roads and human activity may result in prairie dog, and potentially black-footed ferrets fatalities; and 4) increased human activity may increase the presence of human pets, which potentially could result in the introduction of canine distemper.

Alternative 4 would result in an initial direct loss of 3,053 acres and a long-term direct loss of 634 acres of white-tailed prairie dog habitat. An estimated 173 miles of new roads would be constructed under Alternative 4 within white-tailed prairie dog towns. This alternative would have the highest direct impact to black-footed ferret habitat and greatest amount of road construction.

Alternative 4 would construct 846 turbines, which is less than the Alternatives 1R, 2, and 3. It is anticipated that the reduced turbines would result in less human activity on the site. Even with the possible reduction in human activity, personnel could result in the presence of dogs on site potentially exposing the area to canine distemper which is a fatal disease for black-footed ferret.

Surveys for black-footed ferrets would be required before ground disturbing activities within white-tailed prairie dog colonies located in the Bolten Ranch Prairie Dog Complex. The remaining white-tailed prairie dog colonies within the project are in the “block clearance” area, where surveys for black-footed ferrets are not warranted.

Rare Plants

Based on the predictive model of the potential distribution of Ute ladies’-tresses and Colorado butterfly plant (Fertig and Thurston 2003), potential habitat for these two species is not likely to be found in the analysis area for Alternative 4, therefore impacts to either species is unlikely. Surveys will be required in appropriate habitat prior to construction once final siting of project facilities is complete to ensure that impacts to these species do not occur.

Platte River System Species

Under Alternative 4, impacts associated with water depletions would be the same as discussed for Alternative 1R, although the amount of water used would be 137 acre-feet greater (total of 637 acre-feet) under Alternative 4.

Colorado River System Species

Under Alternative 4, impacts associated with water depletions would be the same as discussed for Alternative 1R, although the amount of water used would be 14 acre-feet greater (total of 64 acre-feet) under Alternative 4

4.15.5.2 BLM Sensitive Species

Pygmy Rabbit

Potential impacts to pygmy rabbits include: 1) direct loss of habitat; 2) indirect loss of habitat, including displacement due to increased traffic on roads and human activity; and 3) inadvertent mortalities due to increased traffic on roads and human activity.

Alternative 4 would potentially have an initial direct loss of 7,935 acres and long-term loss of 1,781 acres identified as having some probability of pygmy rabbit occurrence. Most of the initial loss (5,915 acres) and long-term loss (1,366 acres) would occur within areas classified as having a low probability of occurrence according to the WYNDD predictive model (**Table 4.15-13**). This loss would be greater than any of the other alternatives.

Table 4.15-13 Pygmy Probability Model for Alternative 4

	Low Probability of Occurrence (acres)	Moderate Probability of Occurrence (acres)	High Probability of Occurrence (acres)	Very High Probability of Occurrence (acres)
Initial Disturbance	5,915	1,578	442	0.56
Long-term Disturbance	1,366	331	84	0.04

The initial and long-term direct loss of Wyoming big sagebrush, which is a habitat type preferred by pygmy rabbits, would be 901 acres under Alternative 4. Alternative 4 would construct 513 miles of new roads. Both the direct loss of habitat and the new road construction would be the greatest under Alternative 4.

Alternative 4 is designed for only 846 turbines unlike the other action alternatives which all have 1,000 turbines. Therefore, potentially there would be less human activity and indirect disturbance on the site than the other alternatives. However, the reduction in indirect impacts from the decrease in turbines would likely be offset by the increase in road construction.

White-tailed Prairie Dog

Potential impacts to white-tailed prairie dogs include: 1) direct loss of habitat, 2) indirect loss of habitat, and 3) increased traffic on roads and human activity potentially resulting in prairie dog fatalities.

Alternative 4 would have a direct loss of 3,053 acres of white-tailed prairie dog habitat. Alternative 4 would construct 173 miles of new roads within potential habitat. Both the loss of habitat and the new road construction would be the greatest under Alternative 4.

Alternative 4 is slated for 846 turbines and all infrastructure associated with the project will lead to less human activity on the site than the other alternatives. However, the reduction in indirect impacts from the decrease in turbines would likely be offset by the increase in road construction.

Wyoming Pocket Gopher

The potential impacts to Wyoming pocket gopher include: 1) direct loss of habitat; 2) indirect loss of habitat; and 3) increased traffic on roads and human activity resulting in Wyoming pocket gopher fatalities.

Alternative 4 would potentially have an initial direct loss of 7,936 acres and long-term direct loss of 1,783 acres identified as having some probability of Wyoming pocket gopher occurrence. Most of the initial loss (4,785 acres) and long-term loss (971 acres) would occur in areas classified as having a high probability of occurrence according to the WYNDD predictive model (**Table 4.15-14**). Alternative 4 would have the greatest direct loss of areas with a high probability of Wyoming pocket gopher than any other alternative.

Table 4.15-14 Wyoming Pocket Gopher Probability Model for Alternative 4

	Absent (acres)	**Absent (Marginal) of Occurrence (acres)**	**Moderate Probability of Occurrence (acres)**	**High Probability of Occurrence (acres)**
Initial Disturbance	0.2	53	3,098	4,785
Long-term Disturbance	0.1	12	800	971

The initial and long-term direct loss of Gardner's saltbush and winterfat, habitat for Wyoming pocket gophers, would be 933 acres under Alternative 4. Alternative 4 would construct 513 miles of new roads. Both the direct loss of habitat and the new road construction would be greater than any other than any alternative.

Alternative 4 is slated for 846 turbines and all infrastructure associated with the project will lead to less human activity on the site than the other alternatives. However, the reduction in indirect impacts from the decrease in turbines would likely be offset by the increase in road construction.

Columbian Sharp-tailed Grouse

Similar to Alternatives 1R, 2, and 3, no Columbian sharp-tailed grouse leks have been documented within the alternative boundaries or within a 1-mile buffer of the Application Area. Therefore, it is anticipated Alternative 4 would not have any impacts on Columbian sharp-tailed grouse.

Greater Sage-grouse

Impacts to greater sage-grouse under Alternative 4 include direct impacts through collisions with wind turbines and power lines, as well as direct loss of habitat due to ground disturbance activities, indirect loss of habitat due to displacement from wind energy facilities, power lines, and habitat fragmentation.

Alternative 4 would entail constructing 846 wind turbines only on private lands within the Application Area, of which 835 turbines would be located in greater sage-grouse habitat (**Figure 4.15-4**). Similar to Alternatives 1R, 2, and 3, no impacts to greater sage-grouse core breeding areas would occur as a result of this Alternative. This alternative has the highest direct impact to greater sage-grouse habitat,

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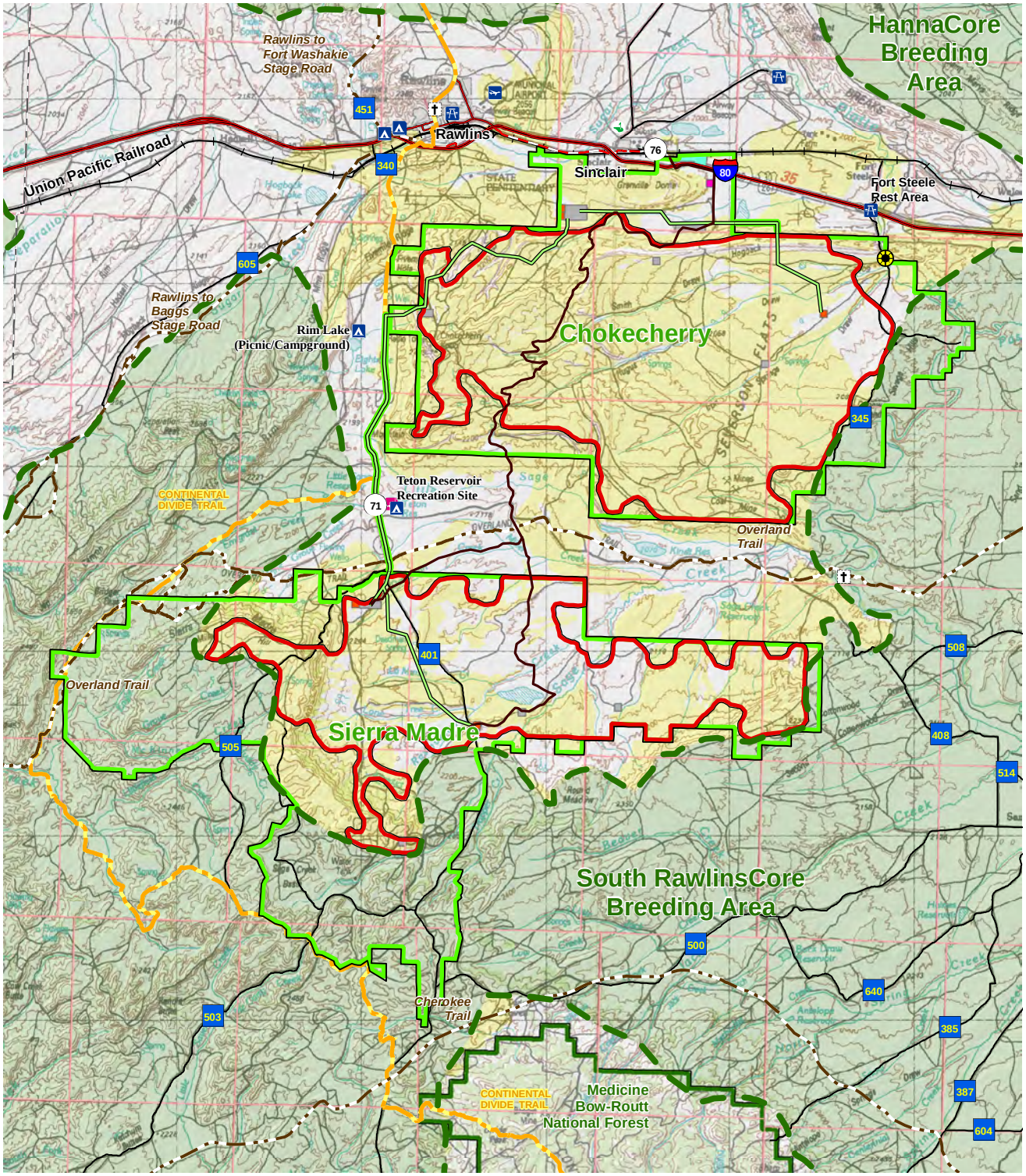

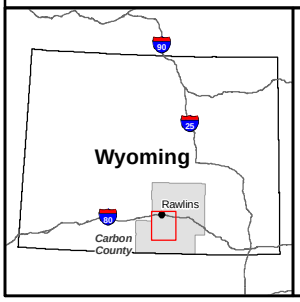

Legend

- Transmission Line
- Haul Road
- Project Area
- Likely Area of Turbine Construction
- Sage Grouse Core Breeding Area
- Sage Grouse Nesting/ Brooding Habitat

Project Facilities

- Water Extraction Site
- Alternate O&M Facility
- Intermodal Rail Facility
- Staging Area (Construction Only)
- Substation
- National Forest

Chokecherry and Sierra Madre Wind Energy Project

Figure 4.15-4

Location of Project Infrastructure associated with Alt. 4 in relation to Greater Sage-grouse Habitat

0 1 2 4 Miles
0 2 4 8 Kilometers
1:320,000
N

with 7,992 acres of non-core habitat being impacted (**Table 4.15-5**). Under Alternative 4, direct disturbances (initial and long-term) would occur to 5.0 percent of the Application Area. Alternative 4 also would have the highest potential for direct impacts associated with new road construction, as 513 miles of new road and 182 miles of new above-ground power line would be required to construct and operate the project.

Alternative 4 also has the second lowest amount of acres of greater sage-grouse core habitat (3,585 acres) as well as non-core habitat (137,628 acres) within 0.5 mile of project infrastructure. Within 4 miles of project infrastructure, Alternative 4 has the highest amount of core (133,001 acres) and non-core habitat (274,475 acres) for a combined total of 407,476 acres of greater sage-grouse habitat (**Tables 4.15-6** and **4.15-7**).

Alternative 4 has the most (18) greater sage-grouse leks present within 1 mile of project infrastructure (**Table 4.15-6**). This alternative also has the highest amount (14,286 acres) of core habitat present within 1 mile of project infrastructure (**Tables 4.15-6** and **4.15-7**). The long-term loss of substantial amounts of sagebrush in both core and non-core areas, combined with expansive areas of potential indirect impacts during construction and operation of the facility, would result in habitat loss and disturbance levels exceeding all five significance criteria.

Mountain Plover

Potential impacts to mountain plover include direct loss of habitat, disturbance during breeding periods, the loss of nesting and brood-rearing habitat, and mortality from turbines and vehicle collisions.

Alternative 4 would have the greatest initial and long-term direct loss (2,426 acres and 545, respectively) of mountain plover habitat compared to the other alternatives. Considering the environmental constraints associated with the BLM land, under Alternative 4 the potential direct loss of habitat in relation to suitable habitat within the Application Area would be greater than any other alternative. Alternative 4 would construct 18 miles of new roads within mountain plover habitat, thus increasing the potential for wildlife-vehicle collisions.

Prior to any surface disturbance, site-specific surveys will be required to accurately assess potential impacts to mountain plovers.

Northern Leopard Frog

Potential impacts to northern leopard frog include direct loss of aquatic and upland habitat, potential degradation of aquatic habitats through erosion and runoff, and mortalities from wildlife-vehicle collisions.

Alternative 4 would potentially impact the most ponds considered suitable habitat for northern leopard frogs, based on pond size and location within a grassland habitat, both initially and long term (10 and 4 ponds, respectively). Alternative 4 would result in the greatest amount of potential direct loss both initially (7,199 acres) and long-term (1,659 acres). According to the analysis general amphibians in Section 4.14, Impacts to Wildlife and Fisheries Resources, potential impacts to the aquatic habitat would result from surface disturbance and possible contamination from construction equipment. Under Alternative 4, surface disturbance within the sub-watersheds would range from 0.1 to 0.3 percent during construction phase and 0.1 to 0.3 percent during operation, which is slightly higher than Alternative 1R. The application of BMPs and ACMs will minimize the potential impacts resulting from increased erosion and runoff. Potential contamination of the aquatic habitat from construction equipment is not anticipated based on the establishment of the project's SPCC Plan.

New road construction increases the potential for inadvertent mortality through vehicle collision and general disturbance resulting from increased human activity. This alternative would construct 441 miles of new roads in upland habitat within 3.2 miles of a suitable pond. Alternative 4 would result in

541 stream crossings, resulting in habitat fragmentation and the potential for direct mortalities. Although the number of suitable ponds affected by this impact was the least, the potential direct habitat loss and the amount of new road construction within the habitat would be greater than Alternative 1R.

Sensitive Fish

Alternative 4 has the same boundary as Alternative 1R; however, under current conceptual layout less surface area and road crossings would occur within the McKinney sub-watershed than Alternative 1R. No surface disturbance or stream crossings are anticipated in Little Savery or Muddy Creek-Littlefield Creek sub-watersheds. Section 4.14.6.5 in Impacts to Wildlife and Fisheries Resources, discusses the potential impacts from Alternative 4 to fisheries within the McKinney sub-watershed.

Sensitive Plants

Based on the predictive model of the potential distribution of the six BLM sensitive plants (Fertig and Thurston 2003), two species, Cedar Rim thistle and Gibben's beardtongue, are not likely to be found in the analysis area for Alternative 4, therefore impacts to these species are unlikely.

Persistent sepal yellowcress is most likely to be impacted based on both the predictive model and known occurrence. The likelihood of impacting potential habitat is highest under Alternative 4 than any other alternative. The model predicts areas of high (762.2 acres), medium (76.2 acres), and low (7.0 acres) probability of potential habitat in the analysis area that could be disturbed during project construction. High, medium, and low probability depends on the variables used in the model, which vary by species. Some of the area disturbed during construction would be initial disturbance; the remainder would be long-term operational impacts. According to the model, 347.9 acres of high probability potential habitat, 4.6 acres of medium probability potential habitat, and 1.4 acres of low probability potential habitat would be disturbed long-term.

According to the model, one other BLM sensitive plants could be impacted under Alternative 4, Laramie false sagebrush. During construction, 58.7 acres of medium probability potential habitat for Laramie false sagebrush would be impacted. Of that temporary disturbance, 12.3 acres of medium probability potential habitat for Laramie false sagebrush would be impacted long term during operation of the project. The likelihood of impacting potential Laramie false sagebrush habitat is higher than under Alternative 1R, but less than Alternatives 2 and 3.

4.15.6 Mitigation and Mitigation Effectiveness

As discussed in Section 4.14.7, Mitigation, a wildlife monitoring and mitigation plan will be developed for the project. This plan also would specifically address special status species. The monitoring and plan would provide information that could be used to avoid, minimize and design methods to mitigate impacts to special status species throughout the life of the project. The wildlife monitoring and mitigation plan will provide protocols to monitor special status species responses, habitats, and behavioral shifts, etc. due to the project as well as provide protocols that result in data that can be used to evaluate the effectiveness of management actions designed to avoid, minimize and mitigate identified significant impacts .

GEN-1: Similar to the discussion in Section 4.14.7, Mitigation, the phased construction sequence would have a limited affect on reducing the potential impacts for special status species.

Effectiveness: Concentrating the construction activities in one area during a given year would perhaps reduce the total area avoided by special status species due to increased human activity, but ultimately the entire project would be constructed resulting in the impacts identified in the analysis. As mentioned in the analysis, the magnitude of the potential impacts on most wildlife species would be dependent upon the density and location of infrastructure. The phased construction sequence does not alter the density or location of infrastructure.

As discussed in Section 4.14.7, Mitigation, there would be a potential benefit of the phased construction sequence for northern leopard frog and sensitive fish species habitat. Both the potential to reduce the magnitude of impacts to water quality through the reduction in time that barren soil would be exposed to erosive elements and the potential to improve the BMPs associated with stream crossings would likely reduce the potential impacts associated with construction activities on the northern leopard frog and fish habitats.

Additional mitigation measures to reduce impacts to special status species are discussed below.

SSS-1: Prior to construction activities in suitable pygmy rabbit habitat, presence/absence surveys would be conducted following appropriate protocols. Areas within 0.5 mile of proposed disturbance that show characteristics of pygmy rabbit habitat will be surveyed in accordance with the Interagency Pygmy Rabbit Working Group Survey Protocols (Ulmschneider et al. 2004). If the surveys conclude that the pygmy rabbits occur the “Habitat Preservation and Restoration” conservation measures would apply (Keinath and McGee 2004).

SSS-2: Prior to construction activities in suitable Wyoming pocket gopher habitat, presence/absence surveys would be conducted following appropriate protocols. If active Wyoming pocket gopher mounds are identified by the presence/absence survey, the proposed surface disturbing activities would avoid the active pocket gopher mounds by 75 m (BLM 2009f). However, if the proponent does not wish to avoid the active pocket gopher mounds by 75 m; therefore, classification surveys (via live capture) that must be completed to identify the pocket gopher to the species level responsible for the mounds. If the results conclude that the Wyoming pocket gopher is responsible for the mounds the “Occupied Wyoming Pocket Gopher Habitat Protection Measures” would apply (BLM 2009f). If the results conclude that the associated species is a Northern pocket gopher, then the proposed surface disturbance may proceed without mitigation. If the classification survey fails to conclusively identify the associated pocket gopher to the species level, then it will be assumed that the species is a Wyoming pocket gopher and the “Occupied Wyoming Pocket Gopher Habitat Protection Measures” will apply (BLM 2009f).

Effectiveness: Implementation of SSS-1 and SSS-2 would be effective in reducing impacts to pygmy rabbits and Wyoming pocket gophers by limiting surface disturbance activities in suitable habitat and by implementing specific protection measures to protect individuals in occupied habitat.

4.15.7 Residual Impacts

Residual impacts to special status species would generally be the same as discussed in Section 4.14, Impacts to Wildlife and Fisheries Resources, for wildlife and fisheries.

4.15.8 Irreversible and Irretrievable Commitment of Resources

Irreversible and irretrievable impacts to special status species would generally be the same as discussed in Section 4.14, Impacts to Wildlife and Fisheries Resources, for wildlife and fisheries. Native vegetation and wildlife habitat would be removed in order to accommodate the proposed facilities resulting in an irretrievable commitment of resources for the life of the project. Black-footed ferrets are federally endangered and any loss to a population within the Application Area, if present, and its primary food source (white-tailed prairie dogs) would be irretrievable. Water depletions from the North Platte River and Colorado River basins would result in irretrievable commitment of resources.

4.15.9 Relationship between Local Short-term Uses and Long-term Productivity

If black-footed ferrets are within the affected areas the loss of habitat and prey base could decrease an already small population of black-footed ferret within the Alternatives.

Construction and operation of any of the alternatives would likely impact the long-term productivity of greater sage-grouse habitat in the Application Area.

4.16 Impacts from Noise

The analysis of noise impacts involves the anticipated noise levels at noise sensitive receptors in and near the Application Area. These noise sensitive receptors include historic trails and residences. The analysis area for noise impacts includes the Application Area with a 1,600-foot buffer. Impacts are analyzed primarily on the basis of dB(A) sound levels within the analysis area, specifically analyzing the distance between noise sensitive receptors and the turbines.

Scoping meetings took place August and September 2008 in Saratoga, Rawlins, and Baggs, Wyoming, to gather public input regarding the proposed project. Public comments concerning potential project related noise impacts ranged from noise effects along historic trails to impacts to hunting and impacts to primary access roads and dwellings within and near the Application Area. Management objectives, goals, and actions concerning noise are outlined in **Table 4.16-1**. At this time there are no BLM, state statutes, or local plans specifically tailored towards noise regulation. Carbon County is in the process of drafting wind energy regulations with noise ordinances.

Table 4.16-1 Relevant Management Considerations for Noise

BLM RMP and ROD – Noise
Management Objectives • There are no applicable national, BLM, state, or county regulatory guidelines for this resource. The Rawlins RMP (BLM 2008a) does not establish objectives for management of noise.
Management Goals • The BLM RMP, state statutes, and local plans do not specifically state any pertinent management goals concerning noise. The BLM RMP refers to noise almost exclusively in the context of OHV use.
Management Actions[1] • Commercial Wind Energy Centers (WECs) shall not exceed 65 dB(A), as measured at the closest neighboring property line or residence, whichever is closer, or shall not exceed 50 dB(A) if it is determined that a pure tone noise is being generated. The level, however, may be exceeded during short-term events such as utility outages and/or severe wind storms. • WECs must be designed to limit low frequency noise. This entails: – At least 3 blades; – Upwind rotor; – No furling (changing the rotor's plane of rotation); – Tapered and twisted blades; and – A well-designed braking system.

[1] Carbon County proposed and later withdrew these ordinances. No standards are currently in effect, pending development of new ordinances (Fox 2010b).

Possible county regulations still in the planning stage, specify that noise levels would be considered significant if levels of 65 dB(A) are exceeded at the nearest property line or residence, whichever is closer. **Table 4.16-2** describes the guidance used for noise impacts.

Table 4.16-2 Guidance for Noise Impacts

Distance From Noise Receptors At Which Noise Impacts Occur	Regulation/Guidance
1,600 feet for noise emanating from construction related activities	USEPA guidance stipulates the threshold for residential noise impacts resulting from construction activities is reached at 55 dB(A) at 1,600 feet (USEPA 1974)
1,400 feet for noise emanating from a wind turbine during operations[1]	At this distance, noise from a 2MW turbine is approximately 35 dB(A) which is equal to the ambient noise level in a rural setting. A noise sensitive receptor at or within 1,400 feet would begin to notice noise from a turbine above existing ambient levels (British Wind Energy Association [BWEA] 2000; Vestas 2008).

[1] The applicant has committed to setting back wind turbines no less than 2,750 feet from residences.

Assumptions for analysis are as follows:

- Turbines will be placed no closer than 2,750 feet to noise sensitive areas (NSAs);
- Turbines will be designed to limit low frequency noise;
- Projections of existing and project-related vehicle traffic will be available through the transportation section of the NEPA document. Traffic related noise can be extrapolated in proportion to projected changes in traffic volume; and
- Noise is primarily going to be generated from within the Application Area.

4.16.1 Impacts from Noise from the No Action

There would be no impacts from noise under this alternative. Potential noise impacts from construction activities, wind turbines, power lines, and substations would not be realized. Noise in the analysis area would continue to consist of existing ambient noise.

4.16.2 Impacts from Noise from Alternative 1R, Applicant Proposed Alternative

Impacts under the construction phase of Alternative 1R include temporary short-term noise from heavy construction machinery and construction activities, as well as light vehicle construction traffic. Average noise levels for typical construction equipment range from 74 dB(A) for a roller, to 85 dB(A) for a bulldozer, to 88 dB(A) for a crane (Harris, Miller, Miller, and Hanson, Inc. [HMMH] 1995). In general, the dominant noise source from most construction equipment is the diesel engine, which is continuously operating around a fixed location or with limited movement. This is particularly true if the diesel engine is poorly muffled. In a few cases, noise generated by pile driving would dominate. Other sources of continuous noise would include field compressors, bulldozers, and backhoes.

Noise levels for typical construction equipment that would likely be used at a wind turbine project site are about in the 80 to 90 dB(A) range at a distance of 50 feet, as shown in **Table 4.16-3**. For a general assessment of construction impacts, it can be assumed that only two of the noisiest pieces of equipment would operate simultaneously. Assuming geometric spreading only (i.e., a decrease of about 6 dB[A] per doubling of distance from a point source) and an 8-hour work day, on the basis of the noise levels presented in **Table 4.16-3**, it is estimated that with the two noisiest pieces of equipment operating simultaneously at peak load, noise levels would exceed the USEPA guideline for

residential Ldn noise (55 dB[A]) for a distance of about 1,600 feet (USEPA 1974). The actual projected workday will be longer than 8-hours. It is anticipated that a project workday during year 1 will consist of two 10-hour shifts resulting in 20 hours of construction, and one 10-hour shift during years 2, 3, and 4. This distance, 1,600 feet, would decrease if reasonable factors for noise attenuation (e.g., air absorption and ground effects due to terrain and vegetation) and operating loads were considered. Residences within 1,600 feet of peak construction would experience noise levels that exceed the USEPA guidelines, resulting in significant impacts. There are two residences which would be located within 1,600 feet of construction activity. The construction activity impacting these residences would consist of improving access roads and would occur during year 1 of construction and between the months of April and October. The two residences would be located within 645 feet of construction activity, therefore, since they would be within 1,600 feet of construction activities, noise impacts would result that exceed USEPA guidelines. The Overland Trail would be transected by both the haul road and a power line, resulting in short-term noise impacts during construction of these project components. Further analysis will determine if this portion of the Overland Trail is a contributing segment. The impacts to the two affected residences and the Overland Trail would be short-term and temporary in nature. There would be no further impacts to residences due to construction noise for the remainder of the construction period, years 2 through 4.

Table 4.16-3 Noise Levels at Various Distances from Typical Construction Equipment

	Noise Level[1] at Distances (dB[A])					
Construction Equipment	**50 feet**	**100 feet**	**200 feet**	**400 feet**	**800 feet**	**1,600 feet**
Bulldozer	85	79	73	67	61	55
Concrete Mixer	85	79	73	67	61	55
Concrete Pump	82	76	70	64	58	52
Crane, Derrick	88	82	76	70	64	58
Crane, Mobile	83	77	71	65	59	53
Front-end Loader	85	79	73	67	61	55
Generator	81	75	69	63	57	51
Grader	85	79	73	67	61	55
Shovel	82	76	70	64	58	52
Truck	88	82	76	70	64	58

[1] The equivalent steady-state sound level that contains the same varying sound level during a 1-hour period.

Source: HMMH (1995).

Blasting is an additional construction activity that would result in noise impacts that are short-term and temporary. Any blasting activity would require at least 2 business days notice to landowners. All blasting activities also would take place during daylight hours unless previously arranged with and approved by appropriate government agencies.

On-road vehicular traffic includes hauling of materials in and out of the construction site, movement of heavy equipment, and commuter and visitor traffic. The associated noise levels would increase and decrease rapidly. The number of truck trips associated with construction would vary, depending on the construction stage. Potential noise impacts would be greatest at the highest number of peak-hour trips and total heavy-duty truck trips. Local area traffic would consist of mostly light-duty vehicles with

lower-level noise sources. Other vehicular traffic, such as transport of heavy equipment, delivery of general construction materials, and water truck for fugitive dust control, is anticipated; the noise contribution from these sources, however, likely would be short-lived. The relatively high level of ambient noise emanating from within and near the northern portion of the analysis area, such as local traffic, the town of Rawlins, I-80, and the UPRR, results in a low impact to the few noise sensitive receptors, such as local residences, that are clustered in the northern part of the analysis area. Impacts may be more pronounced in the southern portion of the analysis area, where there are more residences and ambient noise is much more rural in nature.

Impacts under the operations phase of Alternative 1R include wind turbine noise, noise from project maintenance vehicles, power line, and substation noise. During operation, major noise sources would be mechanical and aerodynamic noise from wind turbines; transformer and switchgear noise from substations; corona noise from power lines; and vehicular traffic noise. These noise sources are described below.

Wind turbines produce two categories of noise: mechanical and aerodynamic. Recent improvements in the mechanical design of large wind turbines have resulted in significantly reduced mechanical noise (Rogers and Manwell 2002). As a result, aerodynamic noise is the dominant source from modern wind turbines. Aerodynamic noise from wind turbines originates mainly from the flow of air over and past the blades; therefore, the noise generally increases with tip speed. The aerodynamic noise has a broadband character, often described as a “swishing” or “whooshing” sound, and is typically the dominant part of wind turbine noise today. The noise caused by this process is unavoidable. Inflow turbulent noise caused by the interaction of blades with atmospheric turbulence is a major contributor to broadband noise, but it has not yet been fully quantified (Rogers and Manwell 2002).

The effects of noise produced by wind energy centers on big game and hunting are largely unknown. Studies have shown that big game species tend to avoid human disturbance. However, some species, during the operation phase when construction noise and human presence are both diminished, may readjust and reoccupy a disturbed area. It is possible that hunting opportunities may be reduced due to the displacement of some species, but this will likely be caused less by noise generated from wind turbines than the overall loss of habitat. Please see Section 4.14 for a more detailed discussion on impacts to wildlife by the proposed project.

To determine the potential noise impacts at nearby residences from wind turbine operations, sound level would need to be estimated. The sound power level from a single wind turbine is approximately 98 to 100 dB(A) for the rated power of 2 MW (Vestas 2008). Considering geometric spreading only, this results in a sound pressure level of 45 dB(A) at a distance of 385 feet from the turbine, which is about the same level as conversational speech at a 3-foot distance. At a receptor 1,400 feet away, the equivalent sound pressure level would be approximately 35 dB(A). This level is typical of background levels of a rural environment. Under this alternative, there would not be any residences within 1,400 feet of a wind turbine. The nearest turbine to a residence would be greater than 0.5 mile away, resulting in negligible impacts. The Overland Trail, which is the nearest historic trail to the analysis area, is over 0.5 mile away from the nearest turbine at 2,791 feet, resulting in negligible impacts. Concerns have been raised that the sounds emitted from wind turbines can create adverse health effects, however, a report published in 2009 studying the relationship between wind turbine sound and health effects, concluded that no evidence existed for direct physiological effects from infrasound or low frequency sound at the levels being generated from wind turbines (Colby et al. 2009).

Potential power line noise during the operation phase can result from corona discharge, which is the electrical breakdown of air into charged particles. While hardly audible at the edge of the ROW in dry weather, in humid wet conditions water drops collecting on the lines provide favorable conditions for corona discharges. During a rainfall event, noise from corona discharge emanating from a 230 kV line would be at 39 dB(A), at approximately 50 feet from the center of the tower. This would equal the noise

being generated in a library (BPA 1996). In general, because of the arid climate in the analysis area and existing ambient noise, the impact of corona noise is expected to be negligible.

A noise source during the operation phase also can be the transformers at substations. A transformer produces a constant low-frequency humming noise primarily because of the vibration of its core. The average A-weighted core sound level at a distance of 492 feet from a transformer would be about 43 and 46 dB(A) for 100 and 200 million volt-amperes (corresponding to about 80 and 160 MW), respectively (Wood 1992). These noise levels at a distance of 1,640 feet would be 33 and 36 dB(A), which are typical of background levels in a rural environment, resulting in a negligible impact. The nearest location of a transformer to residences and the Overland Trail is greater than 1 mile away.

Noise from traffic during the operations phase would range from light- to medium-duty vehicles, and is expected to be negligible. Overall, the noise levels of continuous site operation would be lower than the noise levels associated with short-term construction activities, and in conjunction with the existing ambient noise, would result in a negligible impact to noise sensitive receptors in the analysis area.

In general, noise impacts from decommissioning activities would be similar to but less than those associated with construction activities because the activity type and level would be similar but shorter in duration. As in the construction period, most of the decommissioning activities would occur during the day, when noise is tolerated better than at night because of the masking effect of background noise. Nighttime noise levels would drop to the background levels of a rural environment because decommissioning activities would cease at night. Like construction activities, decommissioning activities would last for a short period compared with wind turbine operation, and, accordingly, the potential impacts would be temporary and intermittent in nature.

4.16.3 Impacts from Noise from Alternative 2, Checkerboard Only

The impacts from noise under this alternative would be similar, but slightly less than Alternative 1R, as there would be no residences impacted from noise generated by construction activities. Under this alternative, there would not be any residences within 1,400 feet of a wind turbine. The nearest turbine and substation to a residence would both be over 1 mile away. Impacts from construction, turbine, and substation noise to the Overland Trail would be the same as described in Alternative 1R.

4.16.4 Impacts from Noise from Alternative 3, No Miller Hill or Sierra Madre

The impacts from noise under this alternative would be similar, but slightly less than Alternative 1R. There would be no residences impacted from noise generated by construction activities under this alternative, as opposed to Alternative 1R. Additionally, there would not be any residences within 1,400 feet of a wind turbine; the nearest turbine to a residence would be over 1 mile away. The nearest substation to a residence would be over 5 miles away. Impacts from construction and turbine noise to the Overland Trail would be the same as described for Alternative 1R. The nearest substation would be located over 6 miles away, as opposed to 1 mile away as in Alternative 1R.

4.16.5 Impacts from Noise from Alternative 4, Private Lands Only

The impacts from noise under this alternative would be similar, but slightly less than Alternative 1R. There would be no residences impacted from noise generated by construction activities under this alternative, as opposed to Alternative 1R. Additionally, there would not be any residences within 1,400 feet of a wind turbine. The nearest turbine and substation to a residence would both be over 1 mile away. This alternative also would entail the construction of 154 less turbines than Alternative 1R, resulting in the least long-term impacts of any alternative. Impacts from construction, turbine, and substation noise to the Overland Trail would be the same as described in Alternative 2.

4.16.6 Mitigation and Mitigation Effectiveness

In order to mitigate for the two residences within 1,600 feet of access road construction, the following mitigation has been proposed:

N-1: USEPA guidance stipulates the threshold for residential noise impacts resulting from construction activities, including blasting, is reached at 55 dB(A) at 1,600 feet (USEPA 1974). Construction activities exceeding 55 dB(A) should be limited to daytime only, between 7 a.m. and 10 p.m., and week days, when a residence would be within 1,600 feet of construction activities.

N-2: Whenever feasible, multiple construction activities (e.g., blasting and earthmoving) should be scheduled to occur concurrently to minimize the length of time residences within 1,600 feet may be affected.

Effectiveness: It is anticipated that the mitigation measures presented will effectively reduce potential short-term temporary construction noise impacts to the two residences within 1,600 feet of access road construction.

4.16.7 Residual Impacts

Despite the mitigation measures presented, in some instances noise sensitive receptors within the Application Area will still be impacted by short-term temporary construction noise.

4.16.8 Irreversible and Irretrievable Commitment of Resources

Elevated noise levels would occur in and near the Application Area during construction and at a lower level during the operational life of the project which would be an irretrievable loss. However, project-related noise is reversible and would cease after project decommissioning.

4.16.9 Relationship between Local Short-term Uses and Long-term Productivity

Not applicable to this resource.