

4.0 ENVIRONMENTAL CONSEQUENCES

The environmental consequences section analyzes the potential direct and indirect effects that would be caused by implementation of the proposed project, the buried power alternative, the hybrid power alternative, or no action. This section also addresses potential cumulative effects that would be caused by past, present, and reasonably foreseeable future actions in a cumulative effect analysis area. The cumulative effect analysis area is different for each resource that could be affected by the proposed project or alternatives. The cumulative analysis area selected for most resources is one of three areas that include: 1) the project area, which includes the PDU, the NPDU, and the EPDU; 2) the area contained within the project area and the surrounding 7-mile buffer, hereafter referred to as the 7-mile buffer area; and 3) the Great Divide Basin. The past, present, and reasonably foreseeable future actions listed below are located within the Great Divide Basin, and were considered in the cumulative effects analysis. No qualitative data exists for areas of surface disturbance for most of the resource development projects and land uses included below; however, an estimate of the total miles of roads, including county roads and resource development access roads, and the number of oil and gas wells were available.

- ∅ Oil and gas development (including compressor stations, other ancillary facilities, and proposed oil and gas units). An estimated 101 wells are located within the 7-mile buffer area. Most of the wells are oil and gas; a relatively small number of wells are injection and disposal wells. Most of the oil and gas wells are plugged and abandoned.
- ∅ Devon Gas Services CO₂ pipeline: 47-mile-long, 8-inch-diameter pipeline from Bairoil to Beaver Creek Field, WY. In service June 2008.
- ∅ Bison Basin uranium in situ-leach project in south Fremont County (Wildhorse Energy)
- ∅ Lost Soldier and Lost Creek In-Situ projects, SE Sweetwater County (UR-Energy Inc.)
- ∅ Jackpot Mine – Green Mountain Uranium District. Development suspended in 1998 (Rio Tinto Energy America)
- ∅ JAB and Antelope In-Situ leach uranium recovery (Uranium1)
- ∅ Sweetwater Mill - The Sweetwater Mill holds an operating license from the NRC that renewed in 2004 for a 10-year term (Rio Tinto Energy America)
- ∅ Transportation (county roads, resource development access roads, and trails). Approximately 1,150 miles of roads, including county, state, and two-track roads, are located within the 7-mile buffer area.
- ∅ Utilities (electric transmission line, pipeline, and communication corridors)
- ∅ Recreational activities (primarily hunting and ORV use)
- ∅ Livestock grazing

The proposed project would involve development of federal land and minerals associated with 16 well locations, access roads, three injection wells, powerlines, pipelines, a compressor station, and associated facilities, as discussed in Chapter 2. The buried power alternative is the same as the proposed project with the difference that all primary powerlines would be buried. The hybrid power alternative is a mix of overhead and buried primary power. The no action alternative would involve denial of the proposed project for drilling and development in the project area. All of the alternatives are discussed in Chapter 2. Design features that would avoid or reduce effects under the proposed project have been presented in Chapter 2. The following assessment of potential effects considers these measures.

4.1 Geology, Minerals, and Paleontology

This section discusses the direct, indirect, and cumulative effects of the proposed project and alternatives to geology, mineral resources, and paleontology. The resource analysis area is the project area.

4.1.1 No Action

Under the no action alternative, the lessee would be denied their legal rights to explore and develop the federal oil and gas leases on valid leases that have been obtained by the lessee in the three units, and the coordinated plan of development described under the proposed project would not be approved. The federal CBNG resources in the project area would not be depleted by the proposed project if the proposed wells are not drilled. However, under the no action alternative, lease interests in the units would remain with the lessee, and the leases would remain under suspension until the APDs are withdrawn or approved. Future mineral exploration and development in the project area would require a Surface Use Plan and an environmental analysis, including an analysis of the cumulative effects under NEPA.

Past, ongoing, or reasonably foreseeable activities or events, including grazing, oil and gas development, uranium mining, road construction and maintenance, and utilities would have a cumulative effect on geological hazards, mineral resources, and paleontological resources under the no action alternative; however, because development described under the proposed project and the alternatives would not be approved, there would be no incremental effect added to these activities or events from the proposed project.

4.1.2 Proposed Project

Direct and Indirect Effects

Direct impacts to geology would be the increased potential for geologic hazards associated with the alteration of the existing topography, including the increased potential for mass movements such as landslides, and acceleration of erosion. Other potential geologic hazards would be increased risks of earthquakes, subsidence, and the migration and seepage of CBNG to the surface. Design features for the proposed project presented in the sections on Water Resources and Soils would reduce potential effects to the surface geologic environment. Implementation of these measures and adherence to federal and state rules and regulations regarding drilling, testing, and completion procedures would prevent potential effects to the subsurface geologic environment. Design features to mitigate impacts to paleontological resources are included in Chapter 2. No other design features were developed to mitigate impacts to geology or mineral resources.

Use of cut and fill construction techniques to develop well locations and access roads and install pipelines and facilities would alter existing topography. In total, an estimated 157 acres would be affected during initial construction activities. Use of proper construction techniques and design features, as described in Chapter 2, would reduce the effects associated with topographic alteration.

As discussed in Chapter 3, no major landslides or other geologic hazards have been mapped in the project area. Construction would not likely activate landslides, mudslides, debris flows, or slumps. Seismic activity is generally low in the project area; however, a moderate earthquake that could potentially damage project facilities could occur.

No active faults or potential seismic activity have been identified in the project area, therefore no excessive buildup of rock pressure or fracturing of rocks that could cause an earthquake to occur would be anticipated during injection activities (USGS 2005a). Underground injection to dispose of produced water would occur in accordance with federal and state regulatory requirements. Injection wells would be

authorized only where the injection zone is sufficiently porous and permeable that fluids could enter the rock formation without causing excessive buildup of pressure or fracturing of rocks.

Dewatering of unconsolidated alluvial aquifers has caused collapse in other geographic areas, and substantial ground subsidence has occurred. The Fort Union Formation, however, is a consolidated rock unit and is not susceptible to subsidence. Therefore, the pumping of groundwater from up to 16 CBNG wells is not likely to cause noticeable ground subsidence or aquifer compression in the project area.

Gas migration and seepage are naturally occurring processes where coal-beds are extremely close to the surface (WSGS 2004). Target coals are not near the surface in the project area, and therefore, gas migration or seepage are not anticipated. WOGCC and BLM requirements for well drilling and control procedures ensure that each formation remains as isolated as under natural conditions and that the integrity of the well bore remains intact, eliminating the possibility for methane migration in CBNG wells.

Conventional oil and gas produced in the project area is generally produced from geologic formations or structures that underlie the target coals in the Fort Union Formation and the proposed injection zones in the Lance/Fox Hills Formations. Productive formations include primarily the Cretaceous Frontier Formation, which is isolated from the Fort Union Formation by 6,500 ft, and two major aquitard systems (the Lewis Shale and Cody Shale) or the deeper, stratigraphically lower, Jurassic Nugget Formation. Therefore, effects on conventional oil and gas wells from the proposed project would not be anticipated.

Other mineral resources with the potential to be affected by the proposed project include proposed uranium mining near the project area. Uranium deposits are associated with the Battle Spring Formation, which would not be affected by the proposed project. Withdrawal of groundwater from CBNG wells completed in the stratigraphically lower Fort Union Formation would not affect future ISL mining of roll-type uranium deposits associated with Tertiary sandstones that overlie the Fort Union Formation. WOGCC and BLM requirements for well drilling and control procedures ensure that each formation remains as isolated as under natural conditions and that the integrity of the well bore remains intact, eliminating the possibility of effects on overlying Tertiary sandstones.

Surface disturbing activities associated with the proposed project could disturb paleontological resources however. Excavation associated with development of access roads, wellpads, gas and water pipelines, and related gas production and water disposal facilities could expose, damage, or destroy fossil resources. Fossils may be damaged or destroyed by erosion that is accelerated by disturbance from construction. Improved access and increased visibility caused by construction and ongoing production may damage or destroy fossils through unauthorized collection or vandalism. It is not anticipated that development of the project would affect any sensitive resource areas, such as high-density paleontological sites. No known occurrences of paleontological resources are documented in the project area; and the potential for occurrences is classified as moderate (Hanson 2005).

Cumulative Effects

The cumulative effects analysis area for geological hazards, mineral resources and paleontology is the project area. Cumulative effects on geology, minerals, and paleontology would occur from past, ongoing, and reasonably foreseeable surface disturbing activities including exploration and development. Cumulatively, geology and mineral resources in the project area have been or will likely be affected in the foreseeable future by the development of water wells that extract water from shallow formations; conventional wells that produce oil, gas, and water from formations; and excavations and mine workings that remove uranium-bearing rocks.

According to WOGCC's online records, the fields include: Oil and gas production from conventional wells in townships within or adjoining the project area in 11 fields in Townships 26 to 28 North and Ranges 92 to 93 West in Fremont County Antelope Springs (gas), Antelope Springs East (gas), Arapahoe Creek (oil and gas), Boulder Dome (oil), Crooks Creek (gas), Crooks Gap (oil and gas), Golden Goose (oil and gas), Happy Springs (oil and gas), Jade Ridge (oil and gas), Lost Creek (gas), and Sheep Creek (oil). No production records were found for the Osborne Draw field, designated in 1971 in Township 26 North Range 93 West in Sweetwater County.

Cumulative production through the end of 2007 for these fields within and very near the project area has been more than 25 million bbls of oil and 14 million mcf of gas. Only three fields have produced more than 1,000,000 bbls of oil or 1,000,000 mcf of gas: Antelope Springs East (nearly 1.4 million mcf of gas); Crooks Gap (more than 13 million barrels of oil and 1.3 million mcf of gas); and Happy Springs (more than 9 million bbls of oil and 10.9 mcf of gas). Fields still producing (Crooks Creek, Crooks Gap, Golden Goose, Happy Springs, and Sheep Creek) together accounted for 40,327 bbls of oil and 57,434 mcf of gas in 2007. These productive fields have contributed to the cumulative production in the project area and Wyoming, while at the same time adding to the overall depletion of oil and gas resources contained in the following formations: Tertiary (Lance, Wasatch); Cretaceous and Jurassic (Cody, Dakota, Frontier, Muddy, Nugget); and Permian (Phosphoria).

Extensive conventional uranium exploration, development, and production have occurred within and near the project area, removing uranium-bearing rock from surface exposures and subsurface workings in the Battle Spring Formation. Past production of uranium has contributed to the cumulative production of uranium in Wyoming, while at the same time adding to the overall depletion of uranium resources contained in Tertiary sandstones. Future mining of uranium resources in the U.S. would occur using ISL mining techniques that do not require surface or underground excavations or conventional mine workings (Finch 2003). Uranium mining using ISL techniques is proposed for the JAB and Antelope Project, located in close proximity to the proposed and alternative Pappy Draw facilities.

No known past, present, or reasonably foreseeable development, other than the proposed project, would affect the Fort Union Formation (target formation) or the Lance/Fox Hills Formations (proposed injection zone) in the project area. Existing conventional oil and gas wells in the project area (described above) mostly target deeper underlying geologic formations, such as the Cretaceous Frontier and Jurassic Nugget Formations. No active injection or disposal wells are located in the project area or in townships adjoining the project area. Numerous boreholes drilled to evaluate uranium potential likely were not properly plugged, but are unlikely to have penetrated units as deep as the Fort Union Formation. Older oil wells completed at shallower depths may also have the potential to be improperly plugged and abandoned. These occur primarily within the Happy Springs and WC Fields in the North Pappy Draw Unit (WOGCC 2008c).

Existing, proposed, and reasonably foreseeable future actions would not affect landslide deposits and would be unlikely to trigger events such as landslides, mudslides, debris flows, or slumps. Therefore, no incremental increase in cumulative effects associated with geologic hazards would occur. The cumulative effects to the surface geologic environment would be minimized through following proper techniques for wellpad and facility siting, construction, and reclamation. Proposed actions and future activities would require reclamation of disturbed lands and would minimize alterations to topography. Standard stipulations and site-specific construction and reclamation procedures would be required for development on federal lands. These measures would further minimize cumulative effects on the surface geologic environment.

Drilling exploratory wells would contribute to the cumulative knowledge of the occurrence or absence of recoverable CBNG resources in the project area. Testing up to 16 wells may identify that field

development to recover CBNG resources would be feasible, however, if commercial quantities of recoverable CBNG resources are not identified based on the results of the proposed project, additional exploratory wells may or may not be drilled. Therefore, the proposed project is the only CBNG exploration or development in the project area that is currently reasonably foreseeable. If these 16 wells are productive, they would contribute to the cumulative production in the project area and Wyoming, while at the same time adding to the overall depletion of CBNG resources.

No cumulative adverse effects on paleontological resources are anticipated. Adoption of design features prescribed in Chapter 2 could foster cumulative beneficial effects by promoting discovery of new fossil resources or providing paleontologists with evidence that these resources are absent from the area.

4.1.3 Buried Power Alternative

Direct & Indirect Effects

Under this alternative, the effects associated with geologic hazards, mineral resources, and paleontological resources from project activities would not be expected to vary from the effects described for proposed project.

Cumulative Effects

The cumulative effects for the buried power alternative would not be expected to vary from those described above for the proposed project. The contribution to cumulative effects to geology and paleontological resources resulting from the buried power alternative would be most likely be small compared with the effects from other ongoing and foreseeable management activities.

4.1.4 Hybrid Power Alternative

Direct & Indirect Effects

Under this alternative, the effects associated with geologic hazards, mineral resources, and paleontological resources from project activities would not be expected to vary from the effects described for the proposed project.

Cumulative Effects

The cumulative effects for the hybrid power alternative would not be expected to vary from those described above for the proposed project. The contribution to cumulative effects to geology and paleontological resources resulting from the hybrid power alternative would most likely be small compared with the effects from other ongoing and foreseeable management activities.

4.2 Climate and Air Quality

This section discusses the direct, indirect, and cumulative effects of the proposed project and alternatives on air quality. The resource analysis area includes the area within a 100-mile radius of the project area boundary, which contains sensitive areas to be considered for the prediction of impacts to ambient air quality, PSD Class I increments and Air Quality Related Values (visibility and acid deposition).

4.2.1 No Action

Under the no action alternative, the lessee would be denied their legal rights to explore and develop the federal oil and gas leases on valid leases that have been obtained by the lessee in the three units, and the coordinated plan of development described under the proposed project would not be approved. No

additional effects on air quality would occur beyond the current pollutant concentrations if the proposed wells are not drilled. Incremental affects to air quality from the proposed project would not occur. Greenhouse gas emissions would not add to the degradation of air quality and would not contribute to climate change.

For cumulative effects, the plan of development for the Pappy Draw Project described under the proposed project would not be approved, and would not contribute to cumulative effects on air resources from past, ongoing, or reasonably foreseeable activities or events as described under the proposed project. Demand for CBNG locally and nationally, however, may result in new proposals for exploration and development of the project area, resulting in an incremental contribution to cumulative effects on air resources.

4.2.2 Proposed Project

Direct & Indirect Effects

Air emissions would occur from construction and production of gas wells in the project area and use of temporary generators. The effects of fugitive dust on air quality would be minimized through dust abatement practices, as discussed in the design features in Chapter 2. The cumulative effects analysis area for air quality is the area within a 100-mile radius of the project area, which includes include sensitive areas to be considered for the prediction of impacts to ambient air quality, PSD Class I increments and Air Quality Related Values (visibility and acid deposition).

Impacts from Construction

Emissions from construction would include particulate matter 10 micrometers and smaller in diameter (PM₁₀), sulfur dioxide (SO₂), nitrogen oxides (NO_x), carbon monoxide (CO), and volatile organic compounds (VOCs) from ground clearing, use of heavy equipment, drilling, and completion, and from construction of access roads. Emissions from construction are temporary and would occur in relative isolation. Emissions from ongoing maintenance are long term.

The small number of exploratory wells and facilities included in the project would generate only small increases in air pollutants. Some temporary effects on air quality in the immediate vicinity of the project would be caused by particulate matter and exhaust from vehicles and equipment. These effects would be local and would likely be dispersed by prevailing winds.

Impacts from Temporary Generator Use

Air emissions would also include those from temporary generators that would provide power and to each pilot well over the construction phase of the project and the initial period of production until production proves feasible and electric powerlines can be installed. The proposed project is an exploratory study; therefore, generators would be used to power pumps and compressors during initial testing. If the proposed project proves to be feasible, it is estimated that a maximum of 16 propane or diesel generators would be used to provide power for the first 6 to 12 months of the project until the appropriate electrical facilities are constructed and operational.

Typical emission factors per generator were estimated for the Powder River Basin Final Environmental Impact Statement, and are shown in **Table 4-1** (BLM 2003a). Potential direct project air quality impacts would not violate any local, state, Tribal or federal air quality under the proposed project. Localized short-term increases in NO_x and particulate matter 2.5 micrometers and smaller in diameter (PM_{2.5}) concentrations would likely occur, but all maximum concentrations are expected to be below applicable NAAQS and WAAQS. All maximum near-field direct project NO₂, PM₁₀, and SO₂ concentrations are expected to be below applicable PSD Class II increments, and all maximum far-field direct project concentrations are expected to be below applicable PSD Class increments. The results for an assessment that was prepared for a generator set that is being considered for the proposed project include

concentration ranges that are within or close to the near-field concentration ranges for each pollutant shown in **Table 4-1**. The concentration ranges from the assessment were also below the applicable WAAQS (ARCADIS 2008b).

The Pappy Draw Compressor would be a single high-pressure compressor station used to deliver processed gas into a 24-inch transmission line. The compressor would likely be a 1,400 hp reciprocating compressor. The compressor will be a minor source, but will require an air permit review under Wyoming rules. The proposed project would include booster compressors and high-pressure compressors. One 660 hp booster compressor would be co-located with the water injection well in each unit.

Pollutant	Averaging Time	Concentration Range ($\mu\text{g}/\text{m}^3$)	WAAQS ($\mu\text{g}/\text{m}^3$)
Carbon monoxide	1 hour	55.3 – 403.1	40,000
	8-hour	33.2 – 242.9	10,000
Nitrogen dioxide	Annual	1.9 – 7.5	100
PM _{2.5}	24-hour	1.5 – 5.3	65
	Annual	0.1 – 0.4	15
Sulfur dioxide	3-hour	0.2 – 0.4	1,300
	24-hour	0.09 – 0.3	260
	Annual	0.007 – 0.013	60

Source: Powder River Basin Final Environmental Impact Statement BLM 2003a

• $\mu\text{g}/\text{m}^3$ – micrograms per cubic meter

No noticeable deterioration in visibility would occur at Class I or sensitive Class II wilderness areas that are located within 100 miles of project activities (Bridger, Fitzpatrick, and Popo Agie Wilderness Areas). Dispersion by wind of air pollutants generated by the proposed project would likely eliminate formation of regional haze or acid deposition.

If these wells were deemed economical to produce, EnCana would be required to file an application with WDEQ for an air quality permit for oil and gas production facilities under Section 21 of the Wyoming Air Quality Standards and Regulations. No violations of applicable state or federal air quality regulations or standards are expected from direct or indirect emissions of air pollutants from well development (including both construction and operation) in the project area.

Indirect effects to air quality in the project area as well as any areas that could be affected by project-related emissions could occur from potential increases in the human population of the Sweetwater, Carbon, or Fremont Counties induced by the in-migration of workers needed for proposed project activities. Increased levels of air pollutants from potential new residential, commercial, and industrial development could occur from an increase in population. However, it is not anticipated that there will be a significant increase in population from the proposed project workforce.

Cumulative Effects

The cumulative effects analysis area for air quality is the area within a 100-mile radius of the project area, which includes include sensitive areas to be considered for the prediction of impacts to ambient air quality, PSD Class I increments and Air Quality Related Values (visibility and acid deposition) Emissions from past oil and gas projects were likely similar to those discussed for the proposed project above. Reasonably foreseeable future activities, including other oil and gas developments, would generate additional air pollutants. Some temporary effects on air quality would likely occur in the immediate vicinity of drilling activities, created by particulate matter and exhausts from vehicles and equipment. These effects would be local and would be dispersed by the prevailing winds from the west and southwest. The Great Divide EIS (BLM 2003b) presented the results of an air quality analysis for 3,000

oil and gas wells in an area south of the Great Divide Basin. This analysis concluded that the maximum cumulative effects from all sources would not exceed the ambient air quality standards or the PSD Class I increments. While this analysis is not directly applicable to the Great Divide Basin, it does indicate that relatively large numbers of wells do not exceed applicable air quality standards. Therefore, the cumulative effects of the proposed project, when considered in combination with emissions from other oil and gas development in the analysis area, are not likely to exceed applicable air quality standards.

The cumulative effects of other activities in the analysis area, such as livestock grazing, mining, and vehicle emissions from traffic, would likely generate an increase in fugitive dust and air pollutants. Wildland fires can generate large amounts of pollutants in a short period of time; however, the occurrence of these events is rare. No noticeable deterioration in visibility would likely occur at Class I or sensitive Class II wilderness areas located within 100 miles of the project area, except during rare wildland fire events. The formation of regional haze or acid deposition from air pollutants generated by past, present, and reasonably foreseeable future activities would depend on wind speed, which affects air pollution, and visibility through its dispersive effects on pollutants. High wind speeds of 15 miles per hour (mph) or greater tend to disperse pollutants, while calm wind conditions and wind speeds from light to moderate can result in an increase in pollutants, raising concentration levels of pollutants in some locations (USFS 2008).

4.2.3 Buried Power Alternative

Direct & Indirect Effects

Under the buried power alternative, the direct and indirect emissions from facilities would be similar to the emissions described for the proposed project. The schedule to install buried power is anticipated to be the same as for the overhead lines of the proposed project. Additional equipment would be required to construct the buried power alternative, resulting in air emission increases for the duration of construction activities; however, any increase would be negligible relative to the proposed project. Impacts to air quality associated with the buried power alternative would be the similar during the construction and operation phases as the proposed project.

Cumulative Effects

The cumulative effects on air resources for the buried power alternative would not be expected to vary from those described above for the proposed project. The alternative would be a minor source of air emissions, with no noticeable effect on air quality, visibility, or atmospheric deposition.

4.2.4 Hybrid Power Alternative

Direct & Indirect Effects

Under the hybrid power alternative, the direct and indirect effects of emissions from facilities would be identical to the emissions described for the proposed project. The schedule to install buried power is anticipated to be the same as for the overhead lines of the proposed project. Additional equipment would be required to construct the buried power alternative, resulting in air emission increases for the duration of construction activities; however, any increase would be negligible relative to the proposed project. Impacts to air quality associated with the hybrid power alternative would be similar during the construction and operation phases as the proposed project.

Cumulative Effects

The cumulative effects on air resources for the hybrid power alternative would not be expected to vary from those described above for proposed project. The hybrid power alternative would be a minor source of air emissions, with no noticeable effect on air quality, visibility, or atmospheric deposition.

4.3 Soils

This section discusses the direct, indirect, and cumulative effects of the proposed project and no action alternatives on soils. The resource analysis area for soils is the project area.

4.3.1 No Action

Under the no action alternative, the lessee would be denied their legal rights to explore and develop the federal oil and gas leases on valid leases that have been obtained by the lessee in the three units, and the coordinated plan of development described under the proposed project would not be approved. No additional direct, indirect, or cumulative effects on soils would occur if the proposed wells are not drilled. Demand for CBNG locally and nationally, however, increases the potential for new proposals for exploration and development of the project area. Cumulative effects to soils would be similar to those described for the proposed project except that the effects of the proposed project would not be added to the other past, present, and reasonably foreseeable future activities. Future mineral exploration and development in the project area would require a Surface Use Plan and an environmental analysis, including an analysis of the cumulative effects under NEPA.

4.3.2 Proposed Project

Direct & Indirect Effects

The description of the soils resource forms the basis by which to assess the intensity, duration, and extent of direct soil effects associated with the construction of access roads, wellpads, and facilities, and to develop effective design features to prevent, reduce, or eliminate effects to the soils resource. Productivity of soils can be affected by removal of vegetative cover, invasion by undesirable weed species, soil compaction, loss of soil structure, porosity and an increased potential for wind and water erosion. Disturbed soils would be reclaimed and revegetated following construction, using design features described in Chapter 2. Design features would be used during construction, operation, and reclamation to reduce the effects on soil productivity. These design features include: removal and storage of topsoil before drilling, scarification of disturbed areas before soils redistribution, control of noxious weeds and invasive species, and timely and effective erosion control and revegetation of disturbed areas. The remainder of disturbed soil (91 acres) would be reclaimed and revegetated following construction.

The proposed construction and operation of wells, facilities, and access roads could reduce soil productivity in and immediately adjacent to the proposed areas of disturbance. The effects of these activities on soil productivity have been evaluated based on their duration, extent, and intensity, and the measures identified that would be implemented to prevent, or reduce the effects of these activities on soil productivity. Residual effects (if any) to soil productivity and their importance is also identified.

Impacts from Construction

An estimated 147 acres of direct surface disturbance would occur because of drilling and construction of associated facilities. If exploratory wells are productive, an estimated 60 acres would remain disturbed after interim reclamation for the duration of the CBNG pilot project. Therefore, approximately 87 acres would be affected by construction activities and 60 acres would be affected over the life of the project (an estimated 10 years).

Soil would be removed from up to 147 acres, and subsoil and topsoil would be stockpiled separately when constructing the wellpads, compressor pads, roads, flow lines, and facilities for the injection of produced water. Soils would likely be disturbed only at overhead power pole construction locations. Removed and redistributed soils would be compacted in localized areas by equipment traffic, susceptible to accelerated wind and water erosion and deposition because of an increase in the amount of exposed and

unprotected soil surfaces. Truck traffic would compact soils, reduce soil structure, and restrict water infiltration. Tire traffic would damage the soil crust, resulting in an increase in runoff and a reduction in water infiltration. Productivity of soils would decline on disturbed sites as soil structure and porosity would be physically destroyed resulting in reduced soil microbial activity and soil fertility, and interruption of organic matter decomposition and nutrient cycles. The intensity of effects would vary according to the type and location of disturbance from development and CBNG production activities and the period of disturbance before reclamation.

Topsoil would be removed before the initiation of drilling activities and facilities construction. The topsoil would be stockpiled in specific locations around the perimeter of disturbed areas, and protected from wind and water erosion. Seeding may be required, depending on the length of time that topsoil is stockpiled. Erosion control mats may be required as well. Ultimately, this topsoil would be used during reclamation of facilities.

Following construction and drilling, the disturbed areas not required for production of CBNG (or an estimated 87 acres) would be interim reclaimed as described in the Surface Use Plan for each well in Chapter 2 and in the Conditions of Approval attached to the APDs (See Appendix A). . The anticipated reduction in soil productivity would require many years to recover fully in the analysis area because of low annual precipitation, low soil fertility, and the short growing season. Over time, reclamation would reduce erosion in the disturbed areas and would compensate for the short-term loss in soil productivity caused by CBNG development. In general, soil characteristics for potentially disturbed soil units, described in Chapter 3, have limitations for successful reclamation because of slope, depth to bedrock, and erosion hazards. The reclamation potential for these soils range from poor to good.

Impacts from Operations

Effects to soil resources from the production of CBNG in the project area are anticipated to be minimal because of the project facility design which minimizes soil disturbance, the relatively small amount of disturbance to the soil map units (147 acres) when compared to the project area (48,350 acres), the use of proper construction and reclamation techniques, and the implementation of the measures described in Chapter 2. Topsoil would initially be spread on the interim reclaimed area. For the final reclamation, topsoil would be spread over the entire area and reseeded.

Indirect effects to would depend on the effectiveness of erosion control and reclamation in the project area. Any limiting factors in the soil types that may inhibit successful revegetation may contribute to surface water contamination soil runoff.

Cumulative Effects

The cumulative effects analysis area for soil resources is the project area and the surrounding 7-mile buffer. This area is approximately 331,930 acres in size. Cumulative effects to soil resources from past and current projects include oil and gas exploration and development, mining, roads, utility corridors, livestock grazing, and recreational use. About 1,150 miles of roads, mostly associated with uranium exploration and oil and gas development, cross the sub-watershed. There are also many uranium prospecting pits scattered across the analysis area. Most of the existing oil and gas wells have been plugged and abandoned, but the status of reclamation on these sites is unknown. There are 101 wells within the project area plus 7-mile buffer in the OGCC database. Some wells are still in production, four have been spudded, and permits have been issued for an additional 22 wells (including those associated with the proposed project). Existing pipelines and powerlines also cross the sub-watershed. The extent of soil disturbance associated with existing roads, pipelines, powerlines, oil and gas wells, livestock grazing, and recreation, is unknown. The proposed project would add an incremental construction disturbance of 147 acres, which would represent a small portion of the analysis area. In the long term, soil disturbance from the proposed project would be reduced to 60 acres, which accounts for 0.02 percent of the

cumulative analysis area. Surface disturbance has not been estimated for the cumulative analysis area; however, given the small proportion of disturbance from proposed facilities in the cumulative analysis area, it is anticipated that the contribution of the proposed project to the total cumulative disturbance in the cumulative analysis area would also be small.

4.3.3 Buried Power Alternative

Direct and Indirect Effects

The direct and indirect impacts to soil surface cover, soil productivity, sedimentation, runoff, and erosion under this alternative would be similar in nature to those under the proposed project. Any difference in acres of soil disturbance from the proposed project would be negligible compared with the total number of acres in the project area.

Referring back to **Table 2-2**, initial soil disturbance from the underground installation of the powerlines would be approximately 24 acres of the 156 acres of total disturbance. The buried power alternative would disturb 0.32 percent of the project area, which is negligible relative to the total number of acres in the project area. Total short-term soil disturbance (all soil types) from all facilities would be 156 acres. Disturbance remaining after interim reclamation from primary underground powerlines would include disturbance associated with switchgear boxes and fenced sectionalizing cabinets, and would also be 24 acres. Additional long-term disturbance over the life of the project would occur from installation of wellpads and access roads. The total long-term disturbance would be 61 acres. The remainder of disturbed soil (95 acres) would be reclaimed and revegetated following construction.

Overall, the disturbance remaining after construction for the buried power alternative would account for 0.12 percent of the project area, which would be negligible relative to the total project area, as is the case with the proposed project.

Cumulative Effects

The cumulative effects for the buried power alternative would not be expected to vary significantly from those described for the proposed project when compared with all other past, present, and reasonably foreseeable future activities. Soil disturbance is estimated to account for less than 0.1 percent of the cumulative assessment area.

4.3.4 Hybrid Power Alternative

Direct and Indirect Effects

The direct and indirect impacts to soil surface cover, soil productivity, sedimentation, runoff, and erosion under this alternative would be similar in nature to those under the proposed project. The difference in acres of soil disturbance from the alternative relative to the proposed project would be negligible when compared with the total number of acres in the project area.

Soil disturbance from installation of both the overhead and buried powerlines would be 19 acres. Total soil disturbance (all soil types) from construction of all facilities would be 151 acres. Long-term disturbance from underground powerlines, which consists of disturbance remaining after interim reclamation, would include disturbance associated with switchgear boxes, fenced sectionalizing cabinets, and would be 0.2 acres. Long-term disturbance from overhead powerlines would be 1.3 acres. Additional long-term disturbance over the life of the project would occur from installation of wellpads and access roads, including access roads needed for the maintenance of the powerlines. The total long-term disturbance from all facilities under the hybrid power alternative would be 60 acres. Short- and long-term disturbance from this alternative is negligible relative to the total number of acres in the project area.

Overall, the disturbance remaining after construction for the hybrid power alternative would account for 0.12 percent of the project area, which would be negligible when compared with the total number of acres in the project area.

Cumulative Effects

The cumulative effects for the hybrid power alternative would not be expected to vary significantly from those described for the proposed project when compared with all other past, present, and reasonably foreseeable future activities, and would account for less than 0.1 percent of the cumulative assessment area.

4.4 Water Resources

This section discusses the direct, indirect, and cumulative effects of the proposed project and no action alternatives on water resources. The resource analysis area for surface water is the Lost Creek Watershed, and for groundwater the resource analysis areas are the affected formations in the Great Divide Basin.

4.4.1 No Action

Under the no action alternative, the lessee would be denied their legal rights to explore and develop the federal oil and gas leases on valid leases that have been obtained by the lessee in the three units, the coordinated plan of development described under the proposed project would not be approved. No additional effects on ground and surface water resources would occur if the proposed wells are not drilled. Demand for CBNG locally and nationally, however, may lead to potential new proposals for exploration and development of the project area. Future mineral exploration and development in the project area would require a Surface Use Plan and an environmental analysis, including an analysis of the cumulative effects under NEPA. Cumulative effects to water resources would be the same as those described for the proposed project except that the effects of the proposed project would not be added to the other past, present, and reasonably foreseeable future activities.

4.4.2 Proposed Project

The discussion of the potential effects of the proposed project on water resources is divided into the direct and indirect effects on groundwater, the direct and indirect effects on surface water, and the cumulative effects to both groundwater and surface water, as discussed below.

4.4.2.1 Groundwater

Direct and Indirect Effects

The proposed project may affect groundwater quality and quantity during construction and operation phase. These effects would be reduced by the implementation of design features and best management practices (BMPs) included in **Chapter 2**. The potential also exists for impacts to groundwater quality from accidental spills during the construction phase. Procedures developed in accordance with federal, state and local regulations and design features (Chapter 2) would adequately mitigate potential impacts from spills during construction.

Groundwater would be removed from water-bearing coal beds in the Fort Union Formation. For the purpose of this analysis, an estimated 15 gpm of produced water has been estimated for each of 16 wells, which would correspond to a groundwater withdrawal (development) of just less than 400 acre-feet per year.

Water contained in the targeted Fort Union coal seams is considered to occur under confined to semi-confined conditions because the seams are bounded by confining layers that consist of impervious to semi-pervious complex sequences of shale and siltstone. Hydraulic connection between the coal seams and any aquifer stratigraphically above or below the coal seams is limited. Groundwater withdrawal from the coal aquifer during well testing would lower the hydraulic head in the coal aquifer, which can induce leakage through the semi-pervious shale layers into the pumped aquifer. Because of the low hydraulic conductivity of the confining layers and the limited number of CBNG wells that would be pumped (16), induced leakage from an aquifer stratigraphically above or below the affected coal seams would be limited.

The water level also may be lowered or drawn down in an area of influence of the exploratory wells. There are eight water wells within 1 mile of proposed CBNG wells. All eight of these wells obtain water from Battle Spring Formation with a greatest available depth of 600 feet. The proposed depth of wells to the target Fort Union Formation is 3,600 to 5,400 feet; therefore, no effects to water wells are expected because of the vertical separation (3,000 feet or greater) and stratigraphic isolation between the existing water wells and the CBNG wells that would be pumped.

Produced water would be disposed of in three deep injection wells. The proposed injection zone is the Fox Hills Formation that occurs at about 4,900 feet in the PDU and is estimated to be as deep as 6,200 feet below the surface in the EPDU area. The proposed deep injection wells would be drilled, cased, and cemented from total depth (50 feet below the base of the Fox Hills Formation) to the surface. The Fox Hills sandstones are isolated below by very low-permeability Lewis Shale and from above by the Lance Formation, which consists of 900 feet of interbedded shale, coal, and clayey sandstone. The Lance Formation also may be considered as an injection zone.

The proposed injection strata, the Fox Hills Formation, would be tested to evaluate its suitability for disposal before any water is injected. Maximum pressure requirements to prevent initiation and propagation of fractures through overlying strata to any zones of fresh water would be determined and would be regulated by the State of Wyoming and the BLM. The injection testing would be used to determine the fracture pressure limits on overlying material. Results of the open-hole log and injection testing would also be provided to the regulatory agencies.

It is anticipated that the produced water that would be injected would be of equal or higher quality with respect to class of use as defined by WDEQ Ground Water Division regulations. Water quality analyses of samples from the existing 4-1H well completed in the Fort Union Formation were presented in **Table 3-4**. A water quality analysis from the Lance Formation from the 4-1H wells was presented in **Table 3-5**. Water quality analyses from the nearest wells completed in the Fox Hills Formation are presented in **Table 3-6**. Similar water quality is expected for water in the Fox Hills Formation underlying the project area. Before produced water is injected, water from the Fox Hills Formation would be analyzed and the results provided to the regulatory agencies. As these tables show, the Fort Union Formation has substantially better water quality than the Fox Hills Formation; therefore, water quality in the Fox Hills Formation would not be degraded. The main effect on the injection horizons would be an increase in the hydraulic head emanating from the injection well, which would dissipate with distance away from the well bore.

Cumulative Effects

The cumulative effects to groundwater resources are analyzed at a regional scale for the Great Divide Basin. Cumulative effects to groundwater resources would probably occur from ongoing exploration and development, existing development projects, and reasonably foreseeable future activities. Cumulatively, groundwater resources in the Great Divide Basin have been affected by development of existing water wells in aquifers that overlie the Fort Union Formation, conventional oil and gas production affecting

units that underlie the Fort Union and Lance/Fox Hills Formations, and past uranium mine workings that likely intercept near-surface groundwater.

Rates of CBNG and water production from future wells and specific information on injection cannot be predicted based on current information. These variables could affect the configuration of field production, gas processing, and gas and water conveyance facilities; however, none of these changes is expected to measurably affect the conclusions presented here. Federal regulations require additional analysis if substantial changes in resource conditions would alter the conclusions reached in this document.

There are no known existing effects to groundwater in the Fort Union and Lance/Fox Hills Formations from water well development, and no mines are likely to intercept groundwater from the Fort Union Formation. To date, there has been limited development in the target Fort Union and Fox Hills Formations in and near the Pappy Draw area. Conventional oil and gas operations in the area focus on deeper Cretaceous and Jurassic geologic formations which are hydraulically isolated from the Fort Union Formation. Therefore, cumulative effects to groundwater resources of the formations would be limited to the anticipated effects of the proposed project: a decline in hydraulic head in the coal aquifer that would be caused by pumping of up to 16 CBNG wells.

Aquifers in units that overlie the Fort Union Formation (alluvial aquifers, Battle Spring Formation, and Wasatch Formation) would be cumulatively affected by the development of existing water wells completed in these units. Based on WSEO records, there are about 85 wells in the four townships encompassing and surrounding the project area. All except six of these wells are less than 1,000 feet deep. The deepest well is the Amoco water well, completed in the Wasatch Formation, which is 2,010 feet deep and is stratigraphically isolated from the Fort Union Formation. Shallow aquifers also could be affected by abandoned or flooded mine workings, but are not likely to be cumulatively affected by the pumping of produced water from the 16 CBNG wells that would be evaluated because of the thick intervening confining layers. There are no known problems with casings, completions, or plugging of past conventional oil and gas wells that could potentially cause contamination of groundwater in aquifers that overlie the Fort Union Formation.

Minimal cumulative effects to aquifers or groundwater quality would be anticipated in units penetrated by existing or anticipated oil and gas drilling. Current and future oil and gas exploration and development in the project area must comply with federal and state environmental regulations. Specifically, wells would be completed in accordance with Onshore Order No. 2 and the BLM requirements that reduce the potential for groundwater contamination or commingling.

Anticipated groundwater use within the Greater Green River Basin which is between 5,300 and 7,200 acre-feet per year (WSEO 2005a), and about 400 acre-feet per year for the proposed project. All anticipated groundwater use within the Greater Green River Basin (less than 8,000 acre-feet per year) would not be expected to affect groundwater storage within the basin; groundwater discharge areas such as springs, seeps, or base flows in drainages; or the basin's outflows to adjoining watersheds, such as the Platte River. Groundwater recharge by precipitation to the Tertiary age rocks of the Greater Green River Basin likely ranges from 50,000 to 100,000 acre-feet per year, which represents an estimate of the cumulative level of groundwater development that can be sustained without adverse effects on the basin's yield or on wells and springs within the basin (WSEO 2005a).

4.4.2.2 Surface Water

Direct and Indirect Effects

Potential effects of the proposed project could occur to overall stream health and watershed conditions during construction and operation phase. Under the proposed project, the potential impacts would be

reduced or eliminated because: 1) the quality or quantity of surface water would not be affected, because all produced water would be injected, and no surface discharge is allowed; 2) design features would be implemented to reduce sedimentation; and 3) the distance from the direct effect areas to any surface water is unlikely given the topography and soil characteristics. EnCana would ensure that produced water is not spilled and that it would not come in contact with surface waters in the project area, based on the use of the design features described in Chapter 2. No surface waters of the state would be affected by the management of produced water. All water disposal and Storm Water Pollution Prevention plans would be permitted with the state agency that regulates the facilities and action including but not limited to the WOGCC, WDEQ, and WSEO. Effects to stream health and watershed conditions would be reduced by the implementation of design features included in 2.5.6 Design Features and in **Appendix A**.

During the construction phase, a temporary reserve pit would be constructed at each new wellpad. Reserve pits would be used to evaporate waste fluids. These reserve pits would be constructed and sited according to the design features described in Section 2.5.6.

Surface disturbance associated with drilling and installing pipelines and utilities would increase the potential for erosion and may increase the sediment and salt loads in the existing drainages. However, there are no perennial surface waters in the project area, and intermittent creeks carry flow primarily from spring and summer precipitation. The nearest perennial surface water with the potential to be affected by surface disturbance activities is Lost Creek, located more than one mile from the nearest proposed facility. Because of this distance, it is highly unlikely that sediment and other contaminants would be transported to surface waters.

Disturbances from project activities include removing vegetation, stockpiling topsoil, constructing roads, or digging shallow excavations for drill pads or facilities. Effects from construction would be greatest in the short term and would decrease over time because of stabilization, reclamation, and revegetation. Construction disturbance would not be uniformly distributed across the project area, but instead would be concentrated near drill locations and access roads. Design features would reduce the impacts of surface disturbing activities in a manner that diverts and controls runoff and provides for re-establishment of vegetation on disturbed areas.

The removal of produced water from the Fort Union Formation and subsequent injection of this water into the Lance/Fox Hills Formations potentially could affect springs, seeps, and other connections between surface water and shallow groundwater. As noted in the Groundwater section above, the vertical separation (3,000 feet or greater) and stratigraphic isolation of the shallow aquifer (Battle Spring Formation) from the CBNG target formation (Fort Union Formation) and proposed injection formations (Lance/Fox Hills) is considerable enough that it is probable that there would be no effects to springs, seeps, or the shallow aquifer.

Cumulative Effects

The cumulative effects analysis area for surface water resources is the Lost Creek sub-watershed of the Great Divide Closed Basin watershed. This sub-watershed encompasses 160,420 acres, including the project area. Cumulative effects to surface water would occur from ongoing exploration and development, recently constructed projects, and other reasonably foreseeable future activities. Surface disturbance increases the potential for erosion and sedimentation. This disturbance would be associated with CBNG-related activities including vegetation removal and topsoil stockpiling, road construction, and shallow excavations for drill pads or other facilities. The contribution of the proposed project to cumulative effects to surface water resources would be negligible, because project related surface disturbance has a low potential to cause surface water contamination given the soil characteristics, topography, and distance of proposed activities from any surface water.

Cumulative effects of other activities in the cumulative effects area associated with surface disturbance, such as livestock grazing, recreation use, uranium exploration and development, and conventional oil and gas development, have potentially affected surface water resources., because surface disturbance activities typically result in an increase in the potential for erosion and sedimentation. However, the extent of these effects, if any, has not been quantified. Numerous two-track roads associated with uranium exploration and oil and gas development cross the project area. There are also many uranium prospecting pits scattered across the project area. Many existing oil and gas wells have been plugged and abandoned, but the status of reclamation on these sites is unknown. Other wells are still in production, and one conventional gas well was drilled in the project area in 2005. Existing pipelines and powerlines also cross the project area.

Reasonably foreseeable future activities in the cumulative effects analysis area, such as livestock grazing, recreational use, and conventional oil and gas development, would be managed according to BLM management objectives, and mitigated using design features required by the BLM or other surface management agency to minimize effects on water resources.

4.4.3 Buried Power Alternative

Direct and Indirect Effects to Groundwater

Under the buried power alternative, the effects on groundwater from project activities would not be expected to vary from the effects described for the proposed project.

Direct and Indirect Effects to Surface Water

Direct impacts to surface water from sedimentation, runoff, and erosion under the buried power alternative would be similar in nature to those under the proposed project. The surface disturbance remaining after interim reclamation for the buried power alternative would account for less than one percent (about 0.126 percent) of the project area, and has a low potential to cause surface water contamination given the soil characteristics, topography, and distance of proposed activities from any surface water.

Cumulative Effects

The cumulative effects to groundwater and surface water for the buried power alternative would not be expected to vary from those described above for proposed project.

4.4.4 Hybrid Power Alternative

Direct and Indirect Effects to Groundwater

Under the hybrid power alternative, the effects on groundwater from project activities would not be expected to vary from the effects described for the proposed project.

Direct and Indirect Effects to Surface Water

Direct impacts to surface water from sedimentation, runoff, and erosion under this alternative would be similar in nature to those under the proposed project. The surface disturbance remaining after interim reclamation for the buried power alternative would account for less than one percent (about 0.124 percent) of the project area, and has a low potential to cause surface water contamination given the soil characteristics, topography, and distance of proposed activities from any surface water.

Cumulative Effects

The cumulative effects to groundwater and surface water for the hybrid power alternative would not be expected to vary from those described above for proposed project.

4.5 Vegetation, Wetlands, and Noxious Weeds

This section discusses the direct, indirect, and cumulative effects of the proposed project and no action alternatives on vegetation, wetlands, and noxious weeds. The resource analysis area is the project area, which includes the PDU, NPDU, and EPDU, and is roughly equal to 48,350 acres or 76 square miles. Likewise, the cumulative effects analysis area for this resource is the project area.

4.5.1 No Action

For the no action alternative, the lessee would be denied their legal rights to explore and develop the federal oil and gas leases on valid leases that have been obtained by the lessee in the three units, and the coordinated plan of development described under the proposed project and the alternatives would not be approved. No additional impacts to vegetation or wetland areas associated with surface disturbance in the proposed project and alternatives would occur. Existing conditions of the resource as described in the affected environment for vegetation in Section 3.5 would not change and would not be affected by project activities. The current management direction for the resource as described in the land use plan would continue. The no action alternative would not contribute to cumulative effects on vegetation from past, ongoing, or reasonably foreseeable activities or events.

4.5.2 Proposed Action

4.5.2.1 Vegetation

Direct Impacts

Direct impacts include vegetation removal, topsoil loss and compaction, disturbance of biological soil crusts, and increased fugitive dust. Surface disturbance associated with the construction phase would consist of wellpads, access roads, pipelines, powerlines, and compressors would account for 147 acres of short-term construction disturbance and 60 acres of long-term disturbance remaining after interim reclamation. Approximately 95 percent of this short-term disturbance would occur in the Wyoming big sagebrush vegetation type. This represents a short-term loss of 0.30 percent of the sagebrush ecological site in the project area for the life of the project. No areas of shrub-dominated riparian vegetation would be disturbed. Primary power associated with the proposed action would come from overhead powerlines. A 25-foot corridor would be requested by the power utility, PacifiCorp/Rocky Mountain Power, for construction of this overhead line. Within this corridor (approximately 14 acres) vegetation disturbance would be limited to mowing of the sagebrush in the vicinity of power poles and potential clearing of vegetation in the immediate vicinity of the power poles. Bush hogging/mowing rather than blading would leave sagebrush roots and stems in place. Remaining vegetation would regrow and disturbed areas would be reclaimed to BLM standards as described in the project design features identified in Section 2.5.6; Conditions of Approval in the APDs; and Wyoming standard mitigation guidelines; lease stipulations; decisions in the Lander RMP (BLM 1986a) associated with air quality, soils, surface, and groundwater; and vegetation involving interim reclamation and dust abatement (Section 2.5.6) could effectively minimize the impacts to vegetation.

Long-term disturbance associated with the overhead primary power would be limited. Areas immediately around each pole may remain disturbed in the long term as well as repeated driving across sagebrush to access the line as could occur in Segment 1. These disturbances are estimated to be less than 2 acres for the life of the project. **Table 2-5** presents the construction phase and post-interim reclamation

disturbances estimated for each facility type. No residual impacts are expected since all facilities, including the overhead powerlines, would be removed at the end of the project.

Under the proposed project, there would be no direct disturbance to existing wetland ecological sites. The closest wetland ecological sites are within 0.5 mile of the NPDU. Construction, operation, abandonment, and reclamation actions would avoid these isolated ecological sites. Potential surface runoff and sedimentation, topsoil loss and compaction, and disturbance of biological soil crusts from disturbed ecological sites would be minimized through the implementation of appropriate erosion control measures found in the project design features in Section 2.5.6. Increased vehicle traffic on existing and proposed new access routes, especially during dry periods, would be the primary source of fugitive dust settling on roadside vegetation. Project design features to minimize fugitive dust in the project area would be implemented.

Indirect Impacts

Indirect impacts from vegetation removal include the increased potential for non-native/noxious plant establishment and introduction, accelerated wind and water erosion, changes in water runoff in ecological sites due to road/facility construction, soil impacts that affect plant growth (soil erosion or siltation), reduction of wildlife habitat, shifts in species composition and/or changes in vegetative density, and changes in visual aesthetics. Indirect impacts also include the displacement of forage, which may cause an increase in grazing on other vegetation resources that would otherwise not occur.

The creation of disturbed areas may afford noxious weeds the opportunity to establish and spread to undisturbed vegetation communities. If established in the long-term, noxious weeds may out-compete native plant species and reduce the diversity, abundance, and productivity of native plant species in the community. Noxious and invasive weeds establishment, soil impacts, and erosion can delay the success of interim and final reclamation. Changes to vegetation type caused by disturbance could alter domestic and wildlife food supplies. These alterations to plant communities could eventually change the community's successional direction and long-term productivity. Implementation of project design features would minimize the short-term effects of surface disturbance; however, replacement of pre-disturbance vegetation communities would be a long-term effort because of the difficulty and time required to restore native sagebrush (estimated 30 years; Connelly et al. 2004). As part of the proposed project, several project design features, as described in Section 2.5.6, would be used to minimize the potential for effects from noxious weeds.

Under the proposed project, there would be no indirect disturbance to existing wetland ecological sites, the closest of which is within 0.5 mile north of NPDU. As described for direct impacts, these ecological sites would be avoided. Potential surface runoff and sedimentation from disturbed ecological sites would be minimized through the implementation of appropriate erosion control measures, minimizing the potential for indirect impacts to wetland ecological sites.

There are no indirect impacts to special status plant species under the proposed project since there are no identified ecological sites or species within the surveyed portion of the Pappy Draw project area.

Cumulative Effects

The cumulative effects for the proposed project would increase surface disturbing activities and associated vegetation loss (147 acres) by 0.30 percent in the project area during construction phase and 0.12 percent after interim reclamation (60 acres). Implementation of the proposed action would contribute to past and present surface disturbing activities in the analysis area that have affected vegetation including uranium exploration and development, conventional and CBNG exploration and development, roads and utility corridors associated with mining and oil and gas development, livestock and wild horse grazing,

and recreational use. These same activities are expected to continue in the future and to contribute similar effects.

Overhead power and roads associated with the proposed action could contribute to future development in the project area, providing infrastructure (particularly roads and utilities) for future development such as conventional and natural gas development, mining, and ranching (i.e. wells for stock ponds) which could lead to increased vegetation disturbance.

Previous actions including natural resource exploration and development, livestock grazing, and recreational use have contributed to the occurrence of noxious weeds in the project area and will likely do so in the future. The proposed project and its measures to minimize noxious weed establishment and spread would be implemented so as not to contribute to noxious weed occurrence in the project area.

Loss of vegetation during construction and after reclamation would have an effect on grazing, changing the distribution and abundance of available AUMs for wildlife and livestock. Success of interim reclamation of disturbed sites would be required although the semi-desert climatic regime and site-specific soil types may delay successful interim reclamation. Reclaimed areas can differ substantially from undisturbed areas in terms of vegetation cover. Reclaimed areas may not serve ecosystem functions now provided by undisturbed vegetation communities, particularly in the short term when species composition, shrub cover, and other environmental factors would likely be different. Uncontrolled livestock grazing on revegetated sites during the active growing season could reduce and prolong the ability of these sites to successfully revegetate.

The proposed project would not affect the condition or suitability of the project area for wetlands and other aquatic vegetation.

4.5.2.2 BLM Sensitive Plant Species

Direct and Indirect Impacts

There are 12 BLM sensitive plant species for the project area (ARCADIS 2007c) of which only one, the Nelson's milkvetch, had potential ecological site in the area. A rare plant survey conducted in August 2007 specifically for the Nelson's milkvetch revealed neither BLM sensitive species nor suitable ecological site within approximately one mile of the proposed disturbance areas.

Given that sensitive plant species were not identified during field surveys conducted in 2007 (ARCADIS 2007a), impacts to special status plant species under the proposed action would likely be limited to the loss of potential ecological sites for Nelson's milkvetch (i.e., alkaline, often seleniferous, clay soils and sparsely vegetated badlands) within the project area due to surface disturbance, increased fugitive dust, and soil compaction. The lack of occurrence of this type of plant species in the project area is based on natural and biological factors that are unassociated with past and current actions in the project area. Therefore, impacts to occupied ecological sites and individual plants would not occur under the proposed project and would not result in a trend towards Federal listing of the Nelson's milkvetch.

4.5.2.3 Federally Listed Plant Species

Direct and Indirect Impacts

The biological surveys conducted for the project were preceded by an evaluation whether implementation of the proposed project would affect any species that are listed under the ESA, their critical ecological sites, or any species proposed for listing. The federally listed species in Fremont and Sweetwater Counties include the desert yellowhead, Ute ladies-tresses, Western prairie fringed orchid and blowout penstemon. There is no suitable ecological site for any of the federally listed threatened and endangered plant species in the project area.

Given that no suitable ecological site or federally listed plant species was identified in the project area (for species listed in **Appendix E Table E1**) and that no suitable ecological site was identified during the biological survey at the site in 2007 (ARCADIS 2007c), direct impacts to occupied ecological sites and individual sensitive plants would not occur under the proposed project.

Desert Yellowhead

No direct or indirect effects would occur to the desert yellowhead from implementation of the proposed project. This statement is based on the lack of known occurrences of this species in the project area and the lack of suitable ecological sites (barren slopes and ridges on outcrops) in the project area that may support this species. Project activities would not change the condition or availability of existing ecological sites in the project area. Under the proposed project, there are no direct impacts to ridges or outcrops of white silty clay where individual plants would occur. The lack of occurrence of this type of plant species in the project area is based on natural and biological factors that are unassociated with past and current actions in the project area.

Blowout Penstemon

No direct or indirect effects would occur to the blowout penstemon from implementation of the proposed project. This statement is based on the lack of known occurrences of this species in the project area and the lack of suitable ecological sites (sand dunes) in the project area that may support this species. Under the proposed project, there are no direct impacts to a sand dune ecological site where individual plants would occur. Thus, the proposed action would not result in a trend towards Federal listing of the blowout penstemon. The lack of occurrence of this type of plant species in the project area is based on natural and biological factors that are unassociated with past and current actions in the project area.

Ute Ladies-tresses

No direct or indirect effects would occur to the Ute ladies-tresses from implementation of the proposed project. This statement is based on the lack of known occurrences of this species in the project area and the lack of suitable ecological sites (early successional riparian ecological sites where hydrology provides continual dampness to root zone through the growing season) in the project area that may support this species. Under the proposed project, there are no direct impacts to a wetland ecological site where individual plants would occur. The lack of occurrence of this type of plant species in the project area is based on natural and biological factors that are unassociated with past and current actions in the project area.

Western Prairie Fringed Orchid

No direct or indirect effects would occur to the Western prairie fringed orchid from implementation of the proposed project. This statement is based on the lack of known occurrences of this species in the project area and the lack of suitable ecological sites (calcareous prairie or meadow fens) in the project area that may support this species. Under the proposed project, there are no direct impacts to wetland ecological site where individual plants would occur. The lack of occurrence of this type of plant species in the project area is based on natural and biological factors that are unassociated with past and current actions in the project area.

4.5.3 Buried Power Alternative

Direct Effects

Direct impacts associated with the buried power alternative include vegetation removal, topsoil loss and compaction, disturbance of biological soil crusts, and increased fugitive dust. Estimated surface disturbance for the buried power alternative is approximately 156 acres during the construction phase and 61 acres after interim reclamation. Surface disturbance acreage associated with the burial of primary power would require a 25-foot corridor to bury the line. Within this corridor, vegetation, topsoil and

biological crusts would be completely removed from the corridor and stock piled during construction. After interim reclamation, long-term disturbance associated with the buried primary power would be limited to switchgear boxes and sectionalizing cabinets. While the utility line corridor would be reseeded, sagebrush would not be restored during the life of the project as it is estimated to require 30 years for full restoration (Connelly et al. 2004). The buried power alternative is estimated to result in a loss of 0.32 percent of the sagebrush ecological site in the project area for the life of the project. **Table 2-5** presents the construction phase and post-interim reclamation disturbances estimated for each facility type.

Under the buried power alternative, there would be no direct disturbance to existing wetland ecological sites or sensitive plant species.

Indirect Impacts

Indirect impacts associated with the buried power alternative are essentially the same as those associated with the proposed project. The main difference is a slightly larger (9 acre) surface disturbance and the fact that sagebrush and topsoil would be completely removed from the corridor as opposed to being mowed or brush hogged which leaves the vegetation roots and soil in place. This could have an effect on non-native/noxious plant establishment and introduction, accelerated wind and water erosion, changes in water runoff in ecological sites, soil impacts that affect plant growth (soil erosion or siltation), reduction of wildlife habitat, shifts in species composition and/or changes in vegetative density. All disturbed vegetation would be reclaimed to BLM standards; however, replacement of pre-disturbance vegetation communities would be a long-term effort because of the difficulty in restoring the native sagebrush once it is completely removed.

Under the buried power alternative, there would be no indirect impacts to existing wetland ecological sites. Indirect impacts to special status plant species under the proposed project would likely be limited to the loss of potential ecological sites within the Pappy Draw project area.

Cumulative Effects

Total vegetation loss associated with construction phase disturbance (156 acres) would account for 0.32 percent in cumulative analysis area (76-square miles). Disturbance remaining after interim reclamation would account for 0.13 percent in the cumulative analysis area. Past, present, and reasonably foreseeable future activities would not vary notably from those described for the proposed project. Of these activities, livestock and wild horse grazing, and recreational use (hunting in particular) would be most affected by vegetation removal.

While vegetation in the reclaimed buried power corridor would vary visually from the surrounding sagebrush communities, infrastructure associated with the buried power alternative would not distract from visual resources associated with recreation such as hunting and users of the Continental Divide National Scenic Trail after interim reclamation.

4.5.4 Hybrid Power Alternative

Direct Impacts

Direct impacts associated with the hybrid power alternative include vegetation removal, topsoil loss and compaction, disturbance of biological soil crusts, and increased fugitive dust. Estimated surface disturbance for the buried power alternative is approximately 151 acres during the construction phase and 60 acres after interim reclamation. As in the buried power alternative, surface disturbance acreage associated with the burial of primary power would require a 25-foot corridor to bury the line (approximately 9 acres). Within this corridor, vegetation, topsoil and biological crusts would be completely removed from the corridor and stock piled during construction. After interim reclamation, long-term disturbance associated with the buried primary power would be limited to switchgear boxes and

sectionalizing cabinets. While the utility line corridor would be reseeded, sagebrush would not be restored during the life of the project. Construction of the overhead powerline segment of this alternative would require a 25-foot corridor (approximately 10 acres) where disturbance would be limited to mowing of the vegetation in the vicinity of power poles and potential clearing of vegetation in the immediate vicinity of the power poles. Brush hogging/mowing rather than blading would leave sagebrush roots and stems in place. This alternative represents a loss of 0.31 percent of the sagebrush ecological site in the project area for the life of the project. **Table 2-5** presents the construction phase and post-interim reclamation disturbances estimated for each facility type.

Under the hybrid power alternative, there would be no direct disturbance to existing wetland ecological sites or sensitive plant species.

Indirect Impacts

Indirect impacts associated with the buried power alternative are essentially same as those associated with the proposed project. The main difference is a slightly larger (5 acre) surface disturbance. Sagebrush and topsoil would be completely removed from the buried powerline segment corridor and mowed or brush hogged along the overhead powerline segment. Surface disturbance could affect non-native/noxious plant establishment and introduction, wind and water erosion, changes in water runoff in ecological sites, soil impacts that affect plant growth (soil erosion or siltation), reduction of wildlife habitat, shifts in species composition and/or changes in vegetative density. All disturbed vegetation would be reclaimed to BLM standards; however, replacement of pre-disturbance vegetation communities would be a long-term effort because of the difficulty in restoring the native sagebrush once it is completely removed.

Under the hybrid power alternative, there would be no indirect impacts to existing wetland ecological sites. Indirect impacts to special status plant species under the proposed project would likely be limited to the loss of potential ecological sites within the Pappy Draw project area.

Cumulative Effects

Total vegetation loss associated with construction phase disturbance (151 acres) of the hybrid alternative would account for 0.31 percent vegetation loss in cumulative analysis area (76-square miles). Disturbance remaining after interim reclamation (60 acres) would account for 0.12 percent vegetation loss in the cumulative analysis area. Past, present, and reasonably foreseeable future activities would not vary notably from those described for the proposed project.

The potential introduction and spread of noxious weeds in the project area that may affect forage availability and quality would not vary from the effects described for the proposed project.

4.6 Range Resources

This section discusses the direct, indirect, and cumulative effects of the proposed project and no action alternatives on range resources and other land uses. The resource analysis area for range is the project area.

4.6.1 No Action

Under the no action alternative, the lessee would be denied their legal rights to explore and develop the federal oil and gas leases on valid leases that have been obtained by the lessee in the three units, and the coordinated plan of development described under the proposed project would not be approved. No new direct or indirect effects associated with this project would occur to range resources.

The possibility of the spread of noxious weeds associated with this project would not occur, therefore, there would no loss of AUMs associated with this project from noxious weeds. AUMs would not be lost

from surface disturbing activities associated with the proposed project or alternatives, including disturbance from road building and well pads.

Past, ongoing, or reasonably foreseeable activities or events, including grazing, oil and gas development, uranium mining, road construction and maintenance, and utilities would have a cumulative effect on range resources under the No Action Alternative; however, because development described under the proposed project and the alternatives would not be approved, there would be no incremental effect added to these activities or events from the proposed project.

4.6.2 Proposed Project

Direct and Indirect Effects

Construction and operation activities associated with implementation of the proposed project would cause a reduction in the availability of potential forage for livestock, a potential increase in livestock and vehicle collisions, and the potential introduction and spread of noxious weeds in the project area that may affect forage availability and quality. The effects of project construction and operation activities on the availability of forage for wild horses are evaluated below in section 4.12. The potential effects of noxious weeds are discussed in the vegetation section above.

Although construction would cause a loss of forage for livestock, these potential losses would likely represent a small fraction of the available forage in the resource analysis area. In the short term, the loss of potential forage caused by surface disturbance may affect the type or quality of forage in the project areas. After interim reclamation, reclaimed areas may provide livestock with a greater quality of available forage species, as the percentage of gamminoid species to overall forage species would be greater. After final reclamation, natural succession is expected to eventually evolve the vegetative state to near the original plant community.

Increases in the volume and type of project-related vehicle traffic may increase the number of vehicle-livestock collisions.

Cumulative Effects

The cumulative effects analysis area for range is the Green Mountain Common Allotment described in Chapter 3. The primary past and current effects to range resources include reduced forage caused primarily by roads, oil and gas development, and mining; vehicle collisions with livestock; and establishment and spread of noxious weeds. Past and current actions have caused an unquantifiable loss of potential forage in the analysis area. Activities, including natural resource exploration and development and recreational use, have caused increases in local vehicle traffic, although no data exist on the effects on vehicle collisions. Past and current surface disturbance has likely contributed to the potential introduction of noxious weeds as discussed in the Vegetation section. The proposed project would contribute an additional 157 acres of surface disturbance and a temporary increase in the volume and frequency of vehicle traffic in the project area. These project-related effects would be incremental to those effects associated with past and other current activities, and would account for 0.12 percent of disturbance in the cumulative analysis area.

4.6.3 Buried Power Alternative

Direct & Indirect Effects

The impacts to the availability of potential forage for livestock for this alternative would be similar to those posed by the proposed project. The disturbance remaining after construction for the hybrid power alternative would account for 0.13 percent of the project area, resulting in a minimal diminished availability of potential forage.

The potential for livestock and vehicle collisions, decrease in forage availability and quality and the potential introduction and spread of noxious weeds in the project area would not vary from the effects described for the proposed project.

Cumulative Effects

The cumulative effects for the buried power alternative would not be expected to vary from those described for the proposed project. This alternative would account for about 0.13 percent of the availability of forage in the project area. This would be a relatively small incremental increase in cumulative effects in conjunction with all other past, present, and reasonably foreseeable future activities.

4.6.4 Hybrid Power Alternative

Direct & Indirect Effects

The impacts to the availability of potential forage for livestock for the hybrid power alternative would be similar to the proposed project. The disturbance remaining after construction for the hybrid power alternative would account for 0.12 percent of the project area, resulting in a minimal diminished availability of potential forage.

The potential for livestock and vehicle collisions, decrease in forage availability and quality, and the potential introduction and spread of noxious weeds in the project area would not vary from the effects described for the proposed project.

Cumulative Effects

The cumulative effects for the buried power alternative would not be expected to vary from those described for the proposed project. This alternative would account for about 0.12 percent of the availability of forage in the project area. This would be a relatively small incremental increase in cumulative effects in conjunction with all other past, present, and reasonably foreseeable future activities.

4.7 Other Land Uses and Management Areas

The proposed project would not affect any special management areas, including BLM roadless areas, because there are no roadless areas in the project area. The effects of the proposed project on other land uses, such as wildlife habitat, oil and gas development, mining, and recreation, are discussed in other sections in this chapter. Therefore, there is no further discussion of the effects of the no action alternative, the proposed project, and the action alternatives of land uses and special management areas such as roadless areas in the project area.

4.8 Wildlife and Fisheries

The principal impacts to wildlife likely to be associated with the proposed project and the action alternatives include: 1) the loss of certain wildlife habitats due to the development of drilling and production operations, and the installation of powerlines, 2) habitat fragmentation, 3) the displacement of some wildlife species, 4) an increase in the potential for collisions between wildlife and motor vehicles, and 5) an increase in the potential for illegal kill and harassment of wildlife. The resource analysis area for wildlife species is the project area, which is an estimated 48,350 acres or 76 square miles, with the exception of big game and sage-grouse which have expanded analysis areas as defined in their respective sections below.

4.8.1 No Action

Under the no action alternative, the lessee would be denied their legal rights to explore and develop the federal oil and gas leases on valid leases that have been obtained by the lessee in the three units, and the proposed exploration and development project would not be approved and would not proceed. No new direct and indirect effects associated with this project would occur to general wildlife, big game, raptors, federally listed threatened and endangered species, or BLM sensitive species including greater sage-grouse. The cumulative effects of the proposed project would not be added to the other past, present, and reasonably foreseeable future activities.

4.8.2 Proposed Project

The proposed project would potentially affect wildlife species as described for each species below. Species that could be affected include Federally listed species and BLM sensitive species. Design features to mitigate impacts to wildlife are included in Chapter 2, and are summarized below in the appropriate section for each species.

4.8.2.1 General Wildlife

Direct Effects

Project-related surface disturbance, facilities, and human activity would reduce available habitat both by loss and fragmentation. Short-term or construction phase surface disturbance associated with the proposed project would be approximately 147 acres. Direct impacts to wildlife would include the loss of potential nesting, wintering, and foraging habitats. If construction, drilling, and completion were to occur during the spring/summer months, the proposed project could result in reproductive failure (nest/burrow abandonment, and/or mortality of eggs or young). Within the overhead powerline corridor, vegetation disturbance would be limited to mowing of the sagebrush in the vicinity of power poles and potential clearing of vegetation in the immediate vicinity of the power poles, which would be an estimated 3 x 3 foot at each pole for a total of 141 acres of construction disturbance. Bush hogging/mowing rather than blading would leave sagebrush roots and stems in place. While this would facilitate reclamation, shrub dependent and nesting species could still be directly affected due to removal of shrub vegetation. To minimize the effects of habitat loss, all areas would be reclaimed to BLM standards. Disturbance remaining after interim reclamation would be approximately 61 acres. Best management practices and project design features initiated by EnCana (Section 2.5.6) including installation of protective measures around reserve pits and raptor perch-deterrent devices, would help to reduce the impact of the proposed project on the wildlife species.

Construction activities could injure or kill wildlife species that are unable to avoid the activities. Small mammals, burrowing animals, reptiles, and amphibians would be most susceptible to harm because of their inability to avoid construction equipment and their relatively small home ranges. Soil compaction from construction, drilling, and completion activities could displace or deter small mammals, reptiles or amphibians from utilizing suitable habitats. Habitat disturbance and increased human activity in the construction phase would likely result in increased mortality for small and relatively immobile mammal species. Larger and more mobile species, including pronghorn, coyotes, and fledged birds, would be less susceptible to direct harm and would be expected to use other undisturbed suitable habitats in the project area without ill effects to their condition or survivorship.

Most bird species and their nests are protected from take or disturbance under the Migratory Bird Treaty Act of 1918 (MBTA) (16 U.S.C. 703 et seq.), which prohibits killing migratory birds (including raptors) and/or destroying their nests and eggs without a permit. Direct loss of ground nests, eggs and birds from construction activities may occur as songbird nests are not inventoried and often hard to identify and

avoid. Other temporary impacts to migratory birds in the project area would depend on the season of construction, drilling, completion activities and human disturbance. If these activities are completed in the late fall and winter, most migratory species would have left the project area for southern wintering grounds.

Human activities and noise associated with generators and compressor stations may disrupt the behavior of some species, causing individuals to avoid otherwise suitable habitats. Human activities may displace wildlife species in an area that is larger than the physical habitat disturbance. For example, drilling and construction noise has been shown to interfere with the male songbirds' ability to attract mates and defend territory, and the ability to recognize calls from nonspecifics (BLM 2003a).

While temporary pools and springs in the project area may offer suitable breeding habitats for amphibian species, no proposed project activities would occur in wetland and ephemeral wetland habitat, so direct impacts to wetland species breeding would be avoided. Likewise, upland foraging habitat adjacent to these wetlands would be avoided.

Indirect Effects

For all species, increased traffic in the project area has the potential to increase the number of collisions between vehicles and wildlife, although the slower speeds required by the condition of local roads and project speed limits would minimize the frequency of collisions. Implementation of the proposed project could affect nesting, breeding, and foraging in other ways including reduction in habitat for prey species due to clearing of vegetation and introduction of noxious and invasive weeds. Wildlife distribution patterns for mammals could change as a result of reduction of forage and hiding cover, nesting and breeding cover, and thermal cover.

Bird and small mammal accidental drowning in water in temporary reserve pits could result in mortality of individual animals.

Overhead powerlines pose a threat to avian species because of the potential for electrocution or collisions with surface structures and lines. In addition, powerlines and power poles would provide potential perches for raptor species which would increase predation and fragmentation in the sagebrush habitat. Raptors would have the potential to increase predation of some prey species within 0.5 mile on each side of the proposed powerline (BLM 2008d). Some species may avoid suitable habitat near powerlines in an effort to avoid predation.

Cumulative Effects

The cumulative effects analysis area for general wildlife is the project area. This represents a loss of 0.30 percent total habitat in the project area in the short-term and 0.12 percent after interim reclamation. As is typical of the region, past and future actions are expected to be dominated by livestock grazing, oil and gas exploration and development, uranium exploration and mining, utility corridor development, and recreational use. Existing oil and gas facilities and infrastructure including an existing overhead powerline currently extend through the center of the proposed project (from PDU to NPDU), so the additional 8.0 miles of powerlines required by the proposed project would represent an increase in overhead lines rather than an introduction of new lines that would result in a new threat to the area. Past, present, and reasonably foreseeable future activities affect wildlife by destroying or degrading suitable habitats, displacing wildlife from suitable habitats, decreasing in reproductive success and/or nutritional condition from increased energy expenditure due to physical responses to disturbance, an increased potential for vehicle-wildlife collisions, short-term increases in potential harm and injury during construction activities, and promoting an increase in illegal poaching and harassment of wildlife by providing easier access to the cumulative analysis area from the construction and upgrades of area roads. Future activities

are likely to be similar and would cumulatively and incrementally reduce the ability of wildlife habitats to support wildlife species at their current levels for the lifetime of oil and gas development and production in the 76-square-mile analysis area. The cumulative effects analysis area for wildlife depends on the species being analyzed and is discussed for individual species below.

4.8.2.2 Big Game

Direct and Indirect Effects

There is no crucial big game winter range identified in the project area. Implementation of the proposed project would likely alter or destroy up to 147 acres of suitable pronghorn winter-yearlong habitat. Likewise, approximately 10 acres of the 260 acres of mule deer spring, summer, fall range in the project area would be affected by surface disturbing activities. Temporary construction disturbances also result in direct habitat loss; however, these areas should provide some habitat value as they are reclaimed and native vegetation becomes established. Grasses and forbs may be more abundant and productive initially in reclaimed areas; however, shrub communities and sagebrush could take 30 years or more to completely recover (Connelly et. al 2000).

While pronghorn are the big game species that would most likely be affected by the proposed project, any of the big game species in the area could be temporarily displaced within and/or near disturbed areas because of surface disturbance and human activity. Avoidance of the area due to construction, traffic, generator, or compressor activity could result in avoidance of suitable habitat and overuse of other habitat and/or intra- and inter-species competition for resources. Big game animals are expected to return to the project area following construction; however, human activities associated with operation and maintenance in the project area could continue to displace big game (WGFD 2004).

While not likely, there is some potential for collision of big game with guy wires associated with the proposed new overhead powerlines. Increased traffic in the project area has the potential to increase the number of collisions between vehicles and big game, although the slower speeds required by the condition of local roads would minimize the frequency of collisions. Increased human activity would result in a higher potential for increased harassment and/or poaching of big game species.

Cumulative Effects

The cumulative effects analysis area for pronghorn antelope is Pronghorn Herd Unit 615, part of which occupies the entire project area. This herd unit includes approximately 1,850,000 acres of pronghorn winter-yearlong range, including 48,350 acres (less than 3 percent) in the project area. Direct loss of habitat from past development includes, but is not limited to, 101 oil and gas wells and 1,150 miles of road. Past and future actions that are have historically, and are likely to continue to reduce available pronghorn habitat include oil and gas exploration and development, mining, construction of utility and travel corridors, recreational use, and grazing practices. The proposed project would cause a loss of approximately 147 acres (0.3 percent) from construction activities in the winter-yearlong range in the herd unit, and a loss of 61 acres (0.13 percent) after interim reclamation. This loss would have minimal cumulative effects to pronghorn because of the small extent of the effects relative to the large extent of available habitat. Shifts in habitat composition or distribution, as well as avoidance of zones around human activity, could affect the use of migration corridor and the overall pronghorn population in the project area. While pronghorn are expected to return to the project area following construction, populations could be lower than prior to project implementation as human activities associated with operation and maintenance could continue to displace pronghorn.

The cumulative effects analysis area for mule deer is Mule Deer Herd Unit 646. The project area contains 260 acres of spring, summer, fall range in Herd Unit 646. This represents less than 1 percent of the available spring, summer, and fall range of the more than 500,000 acres in the herd unit. In addition,

surface disturbance associated with the project would take place in less than 10 acres of mule deer range in the project area. Based on the limited occurrence of mule deer spring, summer, and fall range in the project area and the availability and suitability of other undisturbed habitats in the project area, the proposed project is not expected to alter impacts to big game species in the analysis area.

4.8.2.3 Raptors

Direct and Indirect Effects

Surface disturbances associated with the proposed project would result in the direct, initial loss of habitat for nesting and foraging. Raptor nesting habitats in this area include cliff faces, buttes, mature trees, power structures and sagebrush. Ground-nesters such as northern harriers may also occupy the project area. Other potential impacts to raptors could include: temporary displacement from suitable habitats during the breeding season due to increased noise levels and visual disturbances on the landscape, reduction in habitat for prey species such as small mammals, songbirds, and reptiles due to clearing of vegetation, invasion of invasive and noxious weeds, and electrocution or collisions with surface powerlines. Ground disturbance would also result in a loss of nests, eggs and/or young for ground-nesters such as northern harriers.

If an active raptor nest is identified within the project area during field surveys, seasonal and spatial buffers and timing stipulations would restrict construction activities during the nesting season and help reduce potential for adverse impacts to raptors, as described in the design features for the mitigation of impacts to wildlife that are summarized in **Section 2.5.6**. Other design features to mitigate impacts to raptors include appropriate design and construction measures would be implemented to minimize the electrocution potential for raptors.

Raptors can be intolerant of human activity and avoid nesting and foraging in proximity to drilling or construction activity (Romin and Muck 1999). Temporary displacement could lead to nest failure or nest abandonment, thereby affecting the breeding pair and their annual productivity. Displacement could also lead to increased use of adjacent habitats, which could lead to increased inter- and intra-species competitions for resources. Temporary displacement of raptors resulting from increased noise levels and visual disturbances during the production phase (including maintenance and monitoring) would be much less intense than impacts associated with the development phase (i.e., construction, drilling, and completion). Long-term elevated noise levels would be restricted to the vicinity of the proposed generators and compressor stations.

Nearly 8 miles of new aboveground utility lines are included in the proposed project. The presence of the power poles for these lines would increase raptor perching and/or nesting opportunities in the project area. These potential perches could alter raptor foraging habits by providing attractive perch sites in areas where mature trees and other natural perches are lacking. To discourage raptor perching within 2.0 miles of active sage-grouse leks, anti-perching devices would be installed on structures within this buffer. While these devices are not expected to alleviate perching, perching is expected to be significantly reduced (Slater and Smith 2008).

These same aboveground utility structures and lines would significantly increase the potential for raptor electrocution and collision in the analysis area. Powerlines not constructed to APLIC suggestions pose an electrocution hazard for eagles and other raptors perching on them.

Current raptor nesting surveys conducted in the project area during the spring and summer of 2007 and 2008 identified one active raptor nesting pair. This provides an indication of nesting density at the site, but nesting is dynamic from season to season, as well as within a season. If construction activities occur during nesting, adult birds may stay away from the nest and chicks for the duration of the activities, or

abandon the nest. Both actions could result in egg or chick mortality. In addition, routine human activities near the nest could draw increased predator activity to the area. To reduce the risk of decreased productivity or nest failure, a 0.75 mile radius timing limitation around active raptor nests during the breeding season would be required. However future human activity associated with maintenance and operation of the proposed project may still have a negative effect on nesting raptors. Disturbances during nest selection periods may result in raptors not selecting the existing nest locations forcing them to relocate to other, possibly less suitable locations. Appropriately timed raptor nesting surveys would be conducted before surface disturbing activities begin during nesting season for the initial disturbance and before each new surface disturbing phase. This action would minimize the potential for affecting new or previously unidentified raptor nests. BLM sensitive raptor species are addressed in more detail in **Section 3.11.3**.

Cumulative Effects

The cumulative effects analysis area for raptors is the project area. Surface disturbance represents a potential loss of 0.30 percent habitat in the project area in the short-term and 0.12 percent after interim reclamation. Past, present, and reasonably foreseeable future actions as described in the cumulative section of general wildlife would likely continue to result in disturbance of nesting raptors including injury and death from electrocution and alteration and loss of suitable habitats. Based on the limited occurrence of raptor in the project area (one known active nesting pair) and the availability and suitability of other undisturbed habitats in the project area, the proposed project is not expected to alter the survivability of any of the raptor species in the analysis area.

4.8.2.4 Federally Listed Species

The black-footed ferret is the only federally listed threatened and endangered species with the potential to occur in the project area. The proposed project would have no effect on this species or its critical habitat.

Black-footed Ferret

No direct or indirect effects would occur to the black-footed ferret from implementation of the proposed project. This is based on the lack of known occurrences in the project area and the lack of potentially suitable white-tailed prairie dog colonies (greater than 200 acres) in the project area (FWS 1989). Colonies less than 200 acres would not support ferrets and thus are “block-cleared”, meaning they don’t require ferret surveys. The lack of occurrence of the black-footed ferret in the project area is based on natural and biological factors that are unassociated with past and current actions in the project area. Project activities would not change the condition or suitability of the project area for future occurrences, natural emigration, or introduction of the black-footed ferret. Future actions, including natural resource development, livestock grazing, and recreational use, would likewise not change the suitability of the project area for the black-footed ferret.

4.8.2.5 BLM Sensitive Species

Several BLM sensitive species (mountain plover, long-billed curlew, ferruginous hawk, greater sage-grouse, burrowing owl, sage thrasher, loggerhead shrike, Brewer’s sparrow, sage sparrow, white-tailed prairie dog, pygmy rabbit, swift fox, dwarf shrew, northern leopard frog, Great Basin spadefoot, boreal toad, and spotted frog) may be affected by the proposed project. The following sections describe the potential direct, indirect and cumulative effects to all these species in general. Those species (mountain plover, ferruginous hawks, sage-grouse, burrowing owl, prairie dogs, and pygmy rabbit) that have either known occurrences in the project area or have protective measures for avoidance during critical seasons as described in the project design features section of Chapter 2 are discussed by species in the sections below.

Direct Effects

For all BLM sensitive species in the project area, project-related activities, including construction and vehicle traffic, have the potential to directly injure or kill individuals or destroy or fragment habitat, particularly sagebrush habitat. Direct Effects to sensitive species that are sagebrush dependent would include the loss of potential nesting, wintering, and foraging habitats. The increase in surface disturbance would open up areas dominated by sagebrush potentially creating open habitat and eventually grass- and forb-dominated areas for species that prefer grassland/open habitat. Increased human activity (e.g. use of access roads and maintenance visits) and associated noise may inhibit foraging or nesting within areas not currently occupied.

There are temporary or permanent water bodies that may be inhabited by sensitive amphibian species in the project area; however, no surface disturbance associated with the proposed project is proposed in wetland areas. While amphibians are known to use upland sites adjacent to wetland habitat seasonally, there is no surface disturbance proposed in proximity to known wetland sites.

If construction, drilling, and completion were to occur during the spring/summer months, the proposed project could result in temporary displacement which could lead to reproductive failure (nest/burrow abandonment and/or mortality of eggs or young) thereby affecting annual productivity. Displacement could also lead to increased use of adjacent habitats, which could lead to increased inter- and intra-species competitions for resources. Temporary displacement of sensitive species resulting from increased noise levels and visual disturbances during the production phase (including maintenance and monitoring) would be much less intense than impacts associated with the development phase (i.e., construction, drilling, and completion). Long-term elevated noise levels would be restricted to the vicinity of the proposed generators and compressor stations.

For avian species and sensitive small mammal species, there is a risk of drowning in reserve pits. Project design features outlined in Section 2.5.6, required operators to install fence temporary reserve pits reduce impacts. For avian species, the risk of electrocution or collisions with aboveground powerlines would be increased in the proposed project area.

Indirect Effects

For all species, increased traffic in the project area has the potential to increase the number of collisions between vehicles and wildlife, although the slower speeds required by the condition of local roads would minimize the frequency of collisions. Implementation of the proposed project could affect nesting, breeding, and foraging in other ways including reduction in habitat for prey species due to clearing of vegetation and introduction of noxious and invasive weeds. Wildlife distribution patterns for mammals could change as a result of reduction of forage and hiding cover, nesting and breeding cover, and thermal cover.

Raptors perching on overhead powerlines could increase predation levels of smaller birds and mammals. Project design features outlined in Section 2.5.6, required operators to install raptor-deterrent devices to reduce impacts. Project design features including installation of protective measures around reserve pits and raptor perch-deterrent devices would help to reduce the impact of the proposed project on the wildlife species.

Bird and small mammal accidental drowning in water in temporary reserve pits could also result in mortality of individual animals.

Cumulative Effects

The cumulative effects analysis area for all BLM sensitive species addressed is the project area with the exception of sage-grouse, which was analyzed in a larger area. Surface disturbing activities associated

with natural resource exploration and development including the construction of two-track roads, exploration pits, wellpads, and pipeline and powerline corridors have caused the loss of wildlife habitats in the analysis area (estimated 95 percent sagebrush habitat). The 147 acres of proposed project-related disturbance and future unquantified vegetation losses would result in a further cumulative loss of vegetation in the analysis area, mostly in the sagebrush habitat type. The loss of vegetation accounts for 0.30 percent in the 76-square-mile analysis area, and would also be small relative to the existing surface disturbance.

Cumulative impacts to BLM special status species would be similar in nature to those discussed above for general wildlife. However, given their ongoing habitat losses, sensitivity to disturbance, and declining population numbers, special status wildlife species would likely be more sensitive than other more common species to impacts related to development in the analysis area. Cumulative effects of ongoing activities may have already resulted in displacement of some species despite protective measures.

The proposed project could contribute to future development by providing the infrastructure (roads, pipelines, overhead powerlines) for future use. Additional cumulative effects associated with future development could include increased powerline collisions, noise displacement, off-road vehicle use, new fence development, and hunting/poaching.

4.8.2.5.1 Mountain Plover

Direct and Indirect Effects

Drilling and other surface disturbing activities associated with the proposed project that may occur during the plover nesting period could result in audible intrusions, reduced reproductive success, and nest abandonment which could have adverse impacts to individual bird health and overall flock populations. Increased human activity and associated noise may inhibit foraging or nesting within areas not currently occupied.

The proposed overhead powerlines would provide perch sites for raptors, increasing the potential for mountain plover predation. This could be a significant impact in the NPDU where mountain plovers have been observed and there is an existing prairie dog colony, although the colony was inactive in 2008 (mountain plovers can be closely associated with prairie dog colonies). While raptor anti-perching devices would be installed along the length of the proposed NPDU line (because of 2.0 miles buffers around active sage-grouse leks) to discourage raptor perching, raptors are likely to use powerline for foraging to some extent.

CBNG infrastructure such as the well houses, roads, pipe line corridors, and nearby metering facilities may provide shelter and den sites for ground predators such as skunks and foxes. Use of roads and pipe line corridors by mountain plovers may increase their vulnerability to vehicle collision and/or predation.

The proposed project could create potential mountain plover habitat. Disturbed ground such as buried pipeline corridors and roads may produce open areas initially sparse or devoid of vegetation that may be attractive to plovers. During a past wildlife survey of the project area, a mountain plover was observed within an existing pipeline corridor where sagebrush was largely absent (ARCADIS 2007a).

To protect nesting mountain plover from the direct effects described above, construction and surface disturbing activities would be prohibited in areas designated as mountain plover habitat during the nesting period of April 10 to July 10. Direct effects to the mountain plover would be minimized by avoiding occupied habitats until young have successfully fledged. Because plover exhibit fidelity to the nesting habitat patches, this measure would minimize the loss of active and suitable nesting habitats in the project area.

Cumulative Effects

The cumulative effects analysis area for this BLM sensitive species is the project area. The cumulative effects analysis area for raptors is the project area. Surface disturbance represents a potential loss of 0.30 percent habitat in the project area before reclamation and 0.12 percent after interim reclamation. Surface disturbing activities associated with past and current natural resource development, grazing, and recreation in the analysis area would have occurred mostly in sagebrush habitat as an estimated 95 percent of the project area is sagebrush. As the Mountain Plover is a species that prefers open habitat, the relatively small loss of potential habitat destroyed from past and current activities has likely had minimal effects on species, depending upon the amount of prairie dog control in the area. The proposed project increase of 8 miles of overhead powerline, a portion of which is in the vicinity of known mountain plover habitat in the NPDU, could contribute to a loss of individual mountain plover habitat but would not likely alter the survivability in the analysis area. Surface disturbance in areas formerly dominated by sagebrush may create habitat for the mountain plover reducing the effects of future habitat loss for this species.

4.8.2.5.2 Ferruginous Hawk

Direct Effects

The proposed project facility locations would not directly alter or destroy potentially suitable nesting habitats for the ferruginous hawk such as hilltops, knolls, and cliffs, but would destroy sagebrush which is also habitat where ferruginous hawks nest in the project area. There is one known active pair in the project area based on surveys in 2007 and 2008 and 19 known historic raptor nests within 2.0 miles of proposed development. Ten of these historic nests are within 0.75 mile from surface disturbance associated with the proposed project (**Figure 3-1**). Construction activities could alter or destroy suitable foraging habitats. Project design features to minimize the effects of nest loss and temporary displacement include pre-construction surveys to determine the presence of nesting ferruginous hawks and observation of no surface disturbance buffers and seasonal restrictions.

There is an increased potential for ferruginous hawks to be electrocuted or collide with the 8 miles of new overhead powerlines constructed for the proposed project. EnCana has committed to implementation of measures to reduce the possibility of raptor collision and electrocution as described in Section 2.5.6 of this EA. While utility structures could pose threats to ferruginous hawks that result in serious injury or mortality, utility poles could also benefit ferruginous hawks by providing perching and/or nesting structures.

Indirect Effects

Drilling and other surface disturbing activities associated with the proposed project that occur during the nesting period could result in audible intrusions, reduced reproductive success, and nest abandonment which could have adverse impacts to individual bird health and overall populations.

Cumulative Effects

The cumulative effects analysis area for the ferruginous hawk is the project area. As described in the sensitive species analysis, surface disturbing activities associated with past and current natural resource development, grazing, and recreation in the analysis area would have occurred mostly in sagebrush habitat as an estimated 95 percent of the project area is sagebrush. Proposed project-related habitat disturbance loss of 0.30 percent and future unquantified vegetation losses would result in a further cumulative loss of vegetation in the analysis area, mostly in the sagebrush habitat type.

Cumulative effects of ongoing activities may have already resulted in displacement of some ferruginous hawks because timing limitations and other stipulations may not apply to these activities. Despite

protective measures, the cumulative effects of several impacts may result in a downward trend for the ferruginous hawk population within the immediate vicinity of the project.

4.8.2.5.3 Greater Sage-grouse

This section discusses the direct, indirect, and cumulative effects of the proposed project on the greater sage-grouse. The resource analysis area is the project area of PDU, NPDU, and EPDU, roughly equal to 48,350 acres or 76 square miles. The cumulative effects analysis area for this resource is the project area plus a 7 mile buffer equaling approximately 331,930 acres or 519 square miles.

Direct Effects

Activities associated with the proposed project would affect sage-grouse in several ways. These effects may include: direct loss or degradation of habitats, habitat fragmentation, and increased direct mortality.

Direct effects to potential nesting and brood rearing activities and habitats would include the initial loss of 147 acres of the sagebrush community. Following successful interim reclamation, long-term loss of habitat for sage-grouse in the project area would be approximately 60 acres. Effects from habitat alteration and destruction have been shown to reduce the number of displaying males and the growth rates at active leks within 2 miles (3.2 km) of habitat disturbance, and additional studies showed that greater sage grouse leks appeared to be negatively influenced if situated within 3.1 miles (5 km) of a drilling rig (Holloran 2005). Fragmentation of sage-grouse habitat is reported to occur upon construction of overhead powerlines for distances up to 0.5 miles on each side (BLM 2008d; Ellis 1987). The 0.5 mile fragmentation distance is associated with overhead hunting perches that overhead utility lines provide to raptors. Within that distance, lek and nesting activity are reportedly reduced (BLM 2008d). Likewise, surface disturbing activities may injure or kill individual grouse.

To minimize these effects, no surface occupancy (NSO) would occur within a 0.25-mile buffer surrounding an active lek, and no human-caused disturbance would be allowed in the buffer area between 8 p.m. and 8 a.m. from March 1 through May 15. In addition, there would be no human-caused disturbance within 2 miles of an active lek from March 15 through July 15. The BLM is exploring the possibility of increasing the protective zone around active leks from 0.25 miles to 0.6 miles and increasing the nesting area buffer from 2 miles to 3 miles. Possible effects to greater sage grouse are discussed below.

Sage-grouse continue to use sites that are fragmented by linear facilities, provided that sufficient sagebrush habitats remain available and that some areas are visually and audibly isolated from physical structures (fences, aboveground powerlines) and actively used roads (BLM 2004). The EPDU and PDU wells would be constructed more than 2 miles from any known greater sage-grouse leks. The NPDU wells and other facilities associated with this project, including pipelines and powerlines, would be constructed within the 2-mile buffer for two known greater sage-grouse leks. Increased predation associated with poor-quality or fragmented habitats can result in reduced reproductive success. Construction of roads, powerlines, pipelines, and other facilities would result in decreased cover and may result in increased nest predation. Pipeline ROWs can be used as travel corridors for mammalian predators, increasing opportunities for predation on sage-grouse (BLM 2008d). Invasion by noxious weeds would result in decreased forb productivity, which may affect the quality of early brood rearing habitat. Sage-grouse habitats would not be restored to pre-disturbance conditions for up to 30 years (Connelly et al 2000) because of the time needed to reestablish sagebrush stands with characteristics that are preferred by sage-grouse.

Installation of aboveground utility lines has also been shown to potentially affect male attendance and growth rate of active leks (Braun et al. 2002). Grouse tend to avoid habitats that have increased vertical diversity (for example, utility poles, towers, buildings, or fences) because these structures can provide

avian predators with perches from which to hunt (Braun et al. 2002). There is an existing overhead powerline (between the Lost Arapahoe and East Antelope leks) which is within 0.75 mile of the East Antelope lek. All new overhead power within 2.0 miles of any sage grouse breeding ground would have anti-perching devices installed on the pole top and horizontal features in an attempt to discourage raptors from perching on the poles. The BLM has found that anti-perch devices are not always effective (BLM 2008d). Aboveground utility lines are also known to increase the risk of avian electrocution and/or collision. There are five proposed electrical power drops associated with the proposed project, though there is no increased risk of electrocution associated with the drops. While construction of new powerlines may increase the potential for collision, measurable mortality due to sage-grouse colliding with conductors is not expected because the birds fly close to the ground below the typical height of powerlines.

Direct mortality of sage grouse could occur from surface disturbing activities. Estimates of mortality associated with this or other activity cannot be quantified. As shown in **Table 3-7** the number of males displaying at a lek in any year fluctuates greatly, and cannot be tied directly to either development nearby or to overall population success of sage-grouse in any given year. The number of displaying males cannot be used as a direct indicator of population or reproductive success since often only a few males successfully breed in any year (BLM, 2008d). Although existing oil or gas wells and other facilities currently exist as close as 0.25 miles of active leks within the 7-mile project buffer (**Figure 3-2**), sage-grouse may avoid nesting within the vicinity of new CBNG wells because of the activities associated with operation and production.

Fences, both existing and proposed within the project area, may be hazardous to sage-grouse because they can result in mortality caused by collision (Connelly et al. 2000). Fences, like overhead powerlines introduce new perches for raptors and potentially change the rate of sage-grouse predation.

Human disturbance, including construction, road use, and noise from project facilities, may result in adverse effects to sage-grouse, particularly during the breeding season. New roads would provide increased access to both public and private lands in the project area. Increased access to public lands could result in greater use of these areas by hunters, and legal hunting pressure and poaching may increase. New roads could result in a potential increase in vehicle collisions with sage-grouse.

Visual and noise-related impacts from construction, drilling, and completion activities could cause temporary or permanent displacement of nesting and brooding sage grouse from affected habitats. To help prevent reproductive failure for any potential sage grouse in the vicinity of the generator or compressor, noise would be regulated and limited to 49 decibels (BLM 2003a). There will likely be avoidance of areas with constant noise by females attempting to nest. Nest failure by females could affect population numbers (Holloran 2005). Although implementation of the proposed project may reduce the number of displaying males, the growth of active leks, and the nesting success of hens, these effects are not expected to affect the status or survivability of this species in the project area or throughout its range. The 2-mile timing stipulation would help protect hens and their brood, as it is estimated that approximately 64 percent of hens nest within a 5-km (3.1 mile) radius of a lek (Holloran 2005).

To minimize disturbance, all proposed construction within the 2 mile buffer of active leks would take place outside of the breeding season (March 15 through July 15), and no direct habitat disturbance would occur within a 0.25-mile buffer surrounding the active lek.

Indirect Effects

Indirect impacts may include a decrease in sage-grouse habitat and therefore a decrease in the sage-grouse population over time. An increase in traffic for the life of the project could result in an overall degradation

of habitat as well. Sagebrush recovery times of approximately 30 years from the time the disturbance has ended may have long term impacts to sagebrush dependent species.

Cumulative Effects

The cumulative effects analysis area for most BLM sensitive species includes the project areas and the surrounding 7 mile buffer. Surface disturbing activities associated with natural resource exploration and development, including the construction of two-track roads, exploration pits, wellpads, and pipeline and powerline corridors, has caused fragmentation and loss of wildlife habitat in the analysis area, mostly sagebrush habitat. There is existing disturbance associated with over 1,450 miles of roads and approximately 101 oil and gas wells exist in the resource analysis area. The 147 acres of proposed project-related disturbance and future unquantified vegetation losses would result in a further cumulative loss of vegetation in the analysis area, mostly in the sagebrush habitat type. The loss of vegetation would be very small relative to the existing surface disturbance in the 519-square-mile analysis area. The cumulative loss of habitat has likely had some effects on BLM sensitive species that occur in the analysis area and use these sagebrush habitats as was described in Section 4.8.2.5.

Maintenance associated with power outages could result in human activity during all seasons. Crews would need to access the powerlines for repair and/or replacement of hardware.

Ongoing activities and development occurring in the analysis area have already affected sage-grouse habitats and populations and have the potential to further disturb, harass, or displace sage-grouse. Of the three known leks in the project area, all three are within 2 miles of existing oil or gas wells, and one is within 0.25 miles of existing oil or gas wells (**Figure 3-2**). Additional cumulative effects which may have substantial negative impacts on sage-grouse populations include powerline collisions, increased raptor predation, noise displacement, drought, off-road vehicle use, new fence development, and hunting (Connelly et al 2004; NRCS 2005).

Implementation of several mitigation measures would reduce the extent of each impact from the proposed project such as no surface occupancy, surface disturbing activity timing stipulations, and anti-perch devices. Cumulative effects of ongoing activities however may have already resulted in displacement of some sage-grouse because timing limitations and other stipulations may not apply to these activities. For example, design features and increased use of access roads and repeated maintenance visits to well pads may impact lek sites and nesting habitat. Despite protective measures, the cumulative effects of several impacts may result in a downward trend for the sage-grouse population within the immediate vicinity of the project.

4.8.2.5.4 Burrowing Owl

Direct and Indirect Effects

No observations of this species were recorded during biological reconnaissance surveys conducted in spring 2005 through 2008 (ARCADIS 2007c and 2008a). Implementation of the proposed project could affect the burrowing owl however, this species has not been observed in the project area during biological surveys in 2005 - 2008. The proposed project could contribute to a loss of actual and potential white-tailed prairie dog habitat or loss by predation in the analysis area. In addition to habitat loss, roads and pipeline corridors in the vicinity of burrowing owl territories may increase their vulnerability to vehicle collision. Likewise, project-related construction activities may injure or harm small mammals that may be prey for the burrowing owl.

If nesting burrowing owls occurred in the vicinity of construction activities, the proposed project could result in disturbances to breeding, nesting, and fledging success. As stated in Chapter 2 in the project design features, appropriate pre-construction burrowing owl surveys would be conducted before

implementation of surface disturbing activities, and if burrowing owls are identified during these surveys, surface disturbing activities would be restricted from May 1 to September 30 to avoid the nesting period, in accordance with BLM stipulations.

There is an increased potential for electrocution by and collisions with the 8 miles of new overhead powerlines constructed for the proposed project. While utility structures could pose threats to burrowing owls that result in serious injury or mortality, these structures could also benefit this species by providing high perches from which to forage.

Despite raptor-deterrent perching devices, overhead powerlines provide perch sites for raptors that could potentially result in increased burrowing owl predation. Additionally, CBNG infrastructure such as roads, pipe line corridors, and nearby metering facilities may provide corridors, shelter, and den sites for ground predators such as skunks and foxes.

Cumulative Effects

The cumulative effects analysis area for this BLM sensitive species is the project area. Surface disturbing activities associated with past and current natural resource development, grazing, and recreation in the analysis area would have occurred mostly in sagebrush habitat, as an estimated 95 percent of the project area is sagebrush. As the burrowing owl is a species that prefers open habitat, especially prairie dog colonies, the cumulative loss of sagebrush habitat has likely had minimal effects on the species. Surface disturbance in areas formerly dominated by sagebrush may create habitat for the white-tailed prairie dog and burrowing owl reducing the effects of future habitat losses for these species. New overhead powerlines could increase predation levels on burrowing owls. Human activities including maintenance actions, which don't require stipulations, may affect burrowing owls in the future. It is unknown if the lack of occurrence of the burrowing owl in the project area is based on natural and biological factors that are unassociated with past and current actions in the project area. The proposed project increase of 8 miles of overhead powerline, a portion of which is in the vicinity of known prairie dog habitat in the NPDU, could contribute to a loss of individual burrowing owl habitat but would not likely alter the survivability in the analysis area.

4.8.2.5.5 White-tailed prairie dog

Direct and Indirect Effects

Two white-tailed prairie dog colonies were located in the project area during past wildlife surveys. In 2008, both colonies were determined to be inactive (ARCADIS 2008c), though they have both been occupied by prairie dogs as recently as 2006 (ARCADIS 2007a). The construction and operation of a new access road, well, pipeline, and overhead powerline in the proposed project area would result in the fragmentation of white-tailed prairie dog habitat used for feeding and shelter in Section 22, T27N-R93W. This prairie dog colony currently resides along an existing pipeline corridor in the area, so the proposed surface disturbance would not cause new fragmentation of the existing colony; however, the proposed overhead powerline would pose a potentially significant new threat to the colony. The colony is within 0.5 mile buffer of the proposed powerline; however, the colony was determined to be inactive in 2008. The overhead powerline would provide increased perching opportunities for raptor species to hunt prairie dogs. The negative effects of predation could fragment current or potential prairie dog habitat for 0.5 mile on either side of the proposed overhead powerline (BLM 2008d).

Increased numbers of motorized vehicles and heavy equipment within the project area could potentially increase prairie dog mortality. Likewise, construction and human activities in the project area may be disruptive to white-tailed prairie dogs.

The proposed project may also produce beneficial effects to prairie dogs because blading and grading of vegetation would create open tracts of potential new habitat for prairie dogs. When the disturbed areas are reclaimed, regrowth of native vegetation would provide forage for prairie dogs.

Indirect Effects

Habitat quality could be degraded by the introduction of noxious and invasive weeds as a result of the proposed project, resulting in decreased visibility, forage quality, and burrow development.

CBNG infrastructure such as the well houses, roads, pipe line corridors, and nearby metering facilities may provide corridors, shelter, or den sites for ground predators such as skunks and foxes.

Cumulative Effects

The cumulative effects analysis area for the white-tailed prairie dog is the project area. Surface disturbing activities associated with past and current natural resource development, grazing, and recreation in the analysis area would have occurred mostly in sagebrush habitat, as an estimated 95 percent of the project area is sagebrush. As the prairie dog is a species that prefers open habitat, the cumulative loss of sagebrush habitat has likely had a minimal effect on the species depending upon the amount of prairie dog control and/or recreation in the area. Past, current and future surface disturbance in areas formerly dominated by sagebrush may create habitat for the white-tailed prairie dog reducing the effects of future habitat losses for these species. The negative effects of raptor predation could fragment current or potential prairie dog habitat for up to 0.5 mile each side (BLM 2008d) along the length of the proposed overhead powerline. Despite protective measures such as raptor-deterrent perching devices and surface occupancy stipulations, the cumulative effects of several impacts may have resulted in a downward trend for the white-tailed prairie dog population within the immediate vicinity of the proposed project.

4.8.2.5.6 Pygmy rabbit

Direct and Indirect Effects

The pygmy rabbit is known to occur in tall and dense sagebrush in the project area particularly in drainages (ARCADIS 2007b). The removal of sagebrush during the construction phase could affect the rabbits' ability to use the area for up to 30 years for full sagebrush restoration (Connelly et al. 2000). Areas not fully reclaimed would result in continued habitat loss. Habitat fragmentation could influence the suitability of adjacent habitats, particularly in undisturbed areas.

Drilling and other surface disturbing activities associated with the proposed project occurring during the breeding period could result in audible intrusions, reduced reproductive success, and nest abandonment which could have adverse impacts to individual rabbit health and overall rabbit populations.

Construction and human activities in the project area may be disruptive to pygmy rabbits. Use of roads and pipe line corridors by pygmy rabbits may increase their vulnerability to vehicle collision.

There would be an increased opportunity for avian species to use overhead powerlines as perches to hunt prey such as pygmy rabbits. Overhead powerlines could fragment habitat for 0.5 mile each side of overhead powerlines (BLM 2008d). CBNG infrastructure associated with the proposed project could provide perches for avian species and/or corridors, shelter, or den sites for ground predators such as skunks and foxes.

Cumulative Effects

The cumulative effects analysis area for the pygmy rabbit this sensitive species is the project area. The 147 acres of proposed project-related disturbance and future unquantified vegetation losses would result

in a further cumulative loss of vegetation in the analysis area, mostly in the sagebrush habitat type. The loss of vegetation would be very small relative to the existing surface disturbance in the 76-square-mile analysis area (0.30 percent). Given the abundance of similar vegetative communities within and surrounding the proposed project, impacts are not expected to alter the survivability of pygmy rabbit populations in the project area.

Surface disturbing activities associated with past and current natural resource development, grazing, and recreation in the analysis area would have occurred mostly in sagebrush habitat as an estimated 95 percent of the project area is sagebrush. Past, current and future surface disturbance in areas formerly dominated by sagebrush may contribute to the loss of this species in the analysis area. The negative effects of raptor predation associated with the proposed and future overhead powerlines could fragment current or potential pygmy rabbit habitat for 0.5 mile on each side of the overhead powerline (BLM 2008d) along the length of the proposed overhead powerline, despite protective measures such as raptor-deterrent perching devices. While there does appear to be undisturbed habitat available in the project area, pygmy rabbit are small animals with relatively small home ranges. The proposed surface disturbance may contribute to a loss of individual pygmy rabbit habitat but would not likely alter the survivability in the analysis area.

4.8.3 Buried Power Alternative

The resource analysis area for wildlife species is the project area, an estimated 48,350 acres or 76 square miles, with the exception of big game and sage-grouse which have expanded analysis areas as defined in the cumulative effects sections below. Under the buried power alternative, primary power would be buried to eliminate the effects to wildlife associated with overhead electrical lines. Burying 8.0 miles of primary powerlines would increase surface disturbance in the project area by approximately 10 acres over the proposed project. The effects on wildlife associated with the buried power alternative are discussed below.

4.8.3.1 General Wildlife, Big Game, and Raptors

Direct Effects

The primary differences between the proposed project and the buried power alternative consist of a slight increase (10 acres) in the number of acres cleared from sagebrush habitat, the method of vegetation removal within the corridor, a decrease in habitat fragmentation associated with overhead powerlines and raptor predation, and elimination in electrocution or collisions associated with new overhead powerlines.

Under the buried power alternative, an estimated 157 acres of sagebrush habitat would be altered or destroyed. Within the 25-foot wide buried powerline corridor, vegetation, topsoil and biological crusts would be completely removed from the corridor and stock piled during construction. The entire sagebrush plant including the root system would be removed during the installation. While the utility line corridor would be reseeded following construction, replacement of pre-disturbance vegetation communities would be a long-term effort because of the difficulty and time required to restore native sagebrush. This complete removal of sagebrush in the short-term and long-term would fragment the sagebrush habitat and affect wildlife species that depend on sagebrush habitat (for food, shelter, or prey species) in the project area. Other surface disturbing activities such as the construction of well pads, access roads, and associated pipelines would be the same as the proposed project discussed above. While there is a loss of habitat which may affect individual species, the total loss in the project area of only 0.31 percent is negligible.

The elimination of new overhead powerlines would reduce electrocution and collision for bird species. Big game would not likely be affected by the actions under the buried power alternative.

Temporary and permanent water bodies that may be inhabited by sensitive amphibian species would not be affected by the proposed project.

Increased human activity associated with this alternative would be the same as the proposed project. Human disturbance, including construction, road use, and noise from project facilities, may result in adverse effects to sensitive species, particularly during the breeding season. New roads could result in a potential increase in vehicle collisions with sensitive species. New roads would provide increased access to both public and private lands in the project area. Increased access to public lands could result in greater use of these areas by hunters, and legal hunting pressure and poaching may increase.

Indirect Effects

Habitat fragmentation associated with overhead powerlines and raptor predation of some species due to perches provided by overhead powerlines and power poles would be eliminated and indirect effects reduced on smaller birds, mammals and reptiles. The estimated fragmentation of 0.5 mile on each side of the powerline associated with the overhead powerline would decrease to an estimated 25 foot width of short-term habitat loss for the buried primary power system.

Powerline and structures would not be available for perching avian predators in the project area. After interim reclamation, long-term disturbance associated with the buried primary power would be limited to switchgear boxes and sectionalizing cabinets. Sectionalizing cabinets and a surrounding fence placed every 1,200 feet, and switchgear boxes at each voltage stepdown location to secondary powerlines would provide perches for avian species. While these perches would be limited to approximately 4 feet in height and generally not tall enough to provide perching habitat for raptors that may prey on sage-grouse, they could be used by larger bird/raptors to increase foraging of small birds, mammals, and reptiles in areas previously limited in existing perches. Small fenced enclosures would surround each cabinet and gear box, which could result in mortality caused by collision.

Cumulative Effects

Total habitat loss associated with construction phase disturbance (157 acres) would account for 0.31 percent of the cumulative analysis area (76-square miles). Disturbance remaining after interim reclamation would account for 0.13 percent (61 acres) in the cumulative analysis area. The total habitat loss is negligible for wildlife, big game and raptors. Past, present, and reasonably foreseeable future activities would not vary notably from those described for the proposed project.

Actions associated with the buried power alternative may contribute to a loss of individual habitat for these species but would not likely alter population survivability in the analysis area.

4.8.3.2 BLM Sensitive Species

4.8.3.2.1 Greater Sage-grouse

Direct Effects

The buried power alternative would affect sage-grouse in several ways. These effects may include: direct loss or degradation of sagebrush habitat, 25-ft wide habitat fragmentation, and potential direct mortality. A 25 foot corridor would be cleared of vegetation along the entire width of the buried powerlines for an estimated 7.9 miles. This would result in a long term loss of sagebrush along the corridor although it would be reclaimed with a BLM-approved seed mix. Sagebrush habitat would be fragmented by the 25 foot width of cleared vegetation, but would be reclaimed after the line is buried. The 156 acres of construction phase disturbance would result in a cumulative loss of vegetation in the analysis area, mostly in the sagebrush habitat type which may require 30 years or more to re-establish a sagebrush community. Approximately 61 acres of disturbance would remain after reclamation. The buried power alternative

differs from the proposed action in that there would be no overhead powerlines or power poles and reduced perch sites for predatory raptors. Above ground sectionalizing cabinets would be located every 1200 feet along the line, and switch gear boxes that transform power would be needed where power leaves the main line to connect to the well pad facilities. The sectionalizing cabinets and switch gear boxes are anticipated to be four feet tall and surrounded by similar height fences generally not tall enough to provide hunting perches for raptors that may prey on sage-grouse. Mortality caused by collision with the structures could occur.

Increased human activity associated with this alternative would be slightly greater than the proposed project due primarily to the difference in visual inspections of overhead powerlines from nearby roads versus sectionalizing boxes or switchgear which may involve closer inspection and maintenance. Human disturbance, including construction, road use, and noise from project facilities, may result in adverse effects to sage-grouse, particularly during the breeding season. The effects to sage-grouse from increased access into the project area would be the same as described for the proposed project.

Indirect Effects

The implementation of the buried power alternative would eliminate the effects of aboveground utilities discussed in preceding section. Long term affects would include the loss of some sagebrush habitat due to the clearing of the corridor during trenching activities to bury the power.

Power outages during the winter months may involve more disturbances to wintering habitat if lines need to be excavated to repair an outage.

Cumulative Effects

Cumulative impacts associated with the buried alternative would include the removal of sagebrush and grasses along the entire 25 foot wide corridor where the buried powerline would be installed, versus only mowing of the corridor to install overhead power. The entire sagebrush plant including the root system would be removed during the installation of the buried power. A BLM approved reclamation seed mix would be used in replanting the 25 foot corridor, but mature stands of sagebrush would take approximately 30 years to reach pre-construction conditions. This could impact sagebrush-dependent, BLM-sensitive species discussed further in the next section. If temporarily displaced during construction, suitable habitat for these species does exist adjacent to the proposed activities.

Other surface disturbing activities such as the construction of well pads, access roads, and associated pipelines would be the same as with the proposed project discussed above.

4.8.3.2.2 Other BLM Sensitive Species

Direct and Indirect Effects

For all BLM sensitive species in the project area, project-related activities have the potential to directly injure or kill individuals or destroy or fragment habitat, particularly sagebrush habitat. Direct effects to sensitive species that utilize sagebrush habitat (ferruginous hawk, greater sage-grouse, sage thrasher, Brewer's sparrow, sage sparrow, pygmy rabbit, swift fox, dwarf shrew) would include the loss of potential nesting, wintering, and foraging habitats along the entire 25 foot wide corridor where the buried powerline would be installed, versus only mowing of the corridor to install overhead power. The increase in surface disturbance would open up areas dominated by sagebrush potentially creating open habitat and grass- and forb-dominated areas for species that prefer grassland/open habitat (e.g. mountain plover, long-billed curlew, burrowing owl, loggerhead shrike, white-tailed prairie dog). Other direct and indirect impacts are the same as those described in the wildlife section previously.

In the buried power alternative, buried primary power would eliminate new potential for electrocution and collision for bird species and significantly decrease potential habitat fragmentation associated with raptor predation from overhead structures. According to observations from past wildlife surveys, there are known locations for mountain plover, white-tailed prairie dog, greater sage-grouse, and pygmy rabbit in areas of proposed buried powerlines. These species, as well as other prey species, could be temporarily displaced from suitable habitats in the short term, and there would likely be a reduction of habitat fragmentation in the long term when compared to the proposed project. Sensitive avian species like the ferruginous hawk and loggerhead shrike would have 4-foot high perches instead of perches that are 30 feet in height. These species would not be provided foraging opportunities in the buried power alternative, but neither would they see an increase in electrocution or collisions with overhead wires.

Cumulative Effects

The cumulative effects analysis area for all BLM sensitive species addressed is the project area with the exception of sage-grouse for which a larger cumulative effects analysis area was selected. Surface disturbing activities associated with natural resource exploration and developments include the construction of two-track roads, exploration pits, wellpads, and pipeline and powerline corridors. The 156 acres of proposed project-related disturbance unquantified vegetation losses from future projects in the area would result in a further cumulative loss of vegetation in the analysis area, mostly in the sagebrush habitat type. While this loss of habitat could impact sagebrush dependent species such as the sage-grouse, sage thrasher, loggerhead shrike, Brewer's sparrow, sage sparrow, dwarf shrew, pygmy rabbit, and swift fox, the 0.32 percent loss in the 76-square-mile analysis area would be small relative to the existing surface disturbance. For sage-grouse, approximately 0.0004 percent of the expanded 7-mile buffer analysis area would be affected, which is negligible compared to existing surface disturbance.

Cumulative impacts to BLM special status species would be similar in nature to those discussed above for general wildlife. However, given their ongoing habitat losses, sensitivity to disturbance, and declining population numbers, special status wildlife species would likely be more sensitive than other more common species to impacts related to development in the analysis area. Cumulative effects of ongoing activities may have already resulted in displacement of some species despite protective measures. Past, present, and reasonably foreseeable future activities would not vary notably from those described for the proposed project. Of these activities, livestock and wild horse grazing, and recreational use (hunting in particular) would be most affected by habitat removal.

Actions associated with the buried power alternative may contribute to a loss of individual habitat for these species but would not likely alter population survivability in the analysis area.

4.8.4 Hybrid Power Alternative

The resource analysis area for wildlife species is the project area, estimated 48,350 acres or 76 square miles, with the exception of big game and sage-grouse which have expanded analysis areas as defined in the cumulative effects sections below. The hybrid alternative is similar to the buried power alternative in that primary power would be buried in segments 2 and 4 (see Figure 2-11). The hybrid alternative is similar to the proposed project in that overhead powerlines are proposed in segment 1 and 5. The main difference between the hybrid alternative and the proposed project is the location of the proposed overhead lines in segment 3 and the overall increased length of primary power. The majority of the proposed new overhead powerline in the hybrid power alternative is in Segment 3, and , would be constructed adjacent to an existing overhead powerline. Effects to wildlife associated with the hybrid alternative are discussed below.

4.8.4.1 General Wildlife, Big Game, and Raptors

Direct and Indirect Effects

As in the other two action alternatives, project-related surface disturbance, facilities, and human activity would reduce available habitat both by loss and fragmentation. The primary difference between the proposed project and the hybrid power alternative consists of a slight increase in the number of miles (0.7 mile longer) and number of acres cleared (approximately 5 acres) of sagebrush habitat. Another difference is a reduction in overall habitat fragmentation by installing an overhead powerline along a corridor with an existing powerline and installing a buried powerline in areas where no overhead lines currently exist.

The removal of sagebrush (mowing and blading) for both the overhead and buried powerlines respectively, would fragment the sagebrush habitat and affect wildlife species that depend on sagebrush habitat (for food, shelter, or prey species) in the project area in the short-term and long-term. While this surface disturbance may affect individuals, this loss of habitat would account for only 0.31 percent of the project area in the short term and 0.12 percent in the long term.

The hybrid power alternative has fewer miles of overhead lines than the proposed project (5.7 miles compared to 7.9 miles) resulting in less habitat fragmentation. Sagebrush vegetation would be mowed along the entire overhead powerline corridor during the construction phase. These areas would be reclaimed with a BLM-approved seed mix once overhead powerline construction is complete. In addition to the reduction in total length of overhead line, the placement of the overhead line along an existing powerline corridor (segment 3) would greatly reduce negative impacts such as habitat fragmentation due to raptor predation, electrocution, and/or collisions associated with the overhead power. In this segment, the estimated habitat fragmentation due to raptor predation of up to 0.5 miles on each side of the overhead line (BLM 2008) would not represent new fragmentation to the existing sagebrush habitat. Anti-perching devices installed on the new overhead power poles would further reduce the effects of the new overhead power. While there would be new structures available for perching avian predators in segment 3, the indirect effects on prey species (small mammals, birds, reptiles, sage-grouse, etc.) in the vicinity of the proposed and existing overhead lines would be basically the same.

New overhead power in segments 1 and 5 would pose new threats of habitat fragmentation due to raptor predation, electrocution, and/or collisions as described in the proposed project. In these areas, impacts to raptors in the short and long term could be temporary displacement from suitable habitats due to increased noise levels and visual disturbances, reduction in habitat for prey species such as small mammals, songbirds, sage-grouse, and reptiles due to clearing of vegetation, and invasion of non-native and noxious weeds. New overhead powerlines, even with anti-perching devices, are likely to provide new perches and foraging opportunities for avian species.

In the hybrid alternative, primary power would be buried in segments 2 and 4 where there are currently no overhead lines. New buried lines would fragment habitat for an estimated 25 foot width of short-term habitat loss, but fragmentation due to perching raptors would be reduced. This represents a decrease in overall habitat fragmentation as compared to the proposed project. After interim reclamation, long-term disturbance associated with the buried primary power would be limited to switchgear boxes and sectionalizing cabinets. Sectionalizing cabinets and a surrounding fence placed every 1,200 feet, and switchgear boxes at each transition from primary to secondary power would provide perches for avian species. While these perches would be limited to approximately 4 feet in height, avian predators could affect bird and mammal populations in the area surrounding these structures, but less so than for the taller overhead powerlines. Fences may be a collision hazard to avian species.

Other effects to wildlife are similar to those described for the other action alternatives and are summarized in the following paragraph. Human disturbance, including construction and maintenance,

road use, and noise from project facilities, may disrupt the behavior of some species, causing individuals to avoid otherwise suitable habitat particularly during the breeding season. Soil compaction from construction, drilling, and completion activities could displace or deter small mammals, reptiles or amphibians from utilizing suitable habitats. Implementation of the hybrid power alternative could affect nesting, breeding, foraging and wintering in other ways including reduction in habitat for prey species due to clearing of vegetation and introduction of noxious and invasive weeds. Wildlife distribution patterns for mammals could change as a result of reduction of forage and hiding cover, nesting and breeding cover, and thermal cover.

The effects to sage-grouse from construction activities and increased access into the project area would be the same as described for the proposed project.

Bird and small mammal accidental drowning in water in temporary reserve pits could result in mortality of individual animals.

As in the other action alternatives, project design features (Section 2.5.6) including installation of protective measures around reserve pits, raptor perch-deterrent devices, and wildlife surveys with timing and no surface disturbance stipulations would help to reduce the impact of the proposed project on the wildlife species.

Cumulative Effects

The cumulative effects analysis area for general wildlife is the project area. This represents a loss of 0.31 percent total habitat in the project area in the short-term and 0.12 percent after interim reclamation for the hybrid power alternative.

As is typical of the region, past and future actions are expected to be dominated by livestock grazing, oil and gas exploration and development, uranium exploration and mining, utility corridor development, and recreational use. Existing oil and gas facilities and infrastructure including an existing overhead powerline currently extend through the center of the proposed project (from PDU to NPDU), so the additional powerlines in this segment of the hybrid alternative would represent an increase in overhead lines rather than a new threat to the area.

Past, present, and reasonably foreseeable future activities affect wildlife by destroying or degrading suitable habitats, displacing wildlife from suitable habitats, decreasing in reproductive success and/or nutritional condition from increased energy expenditure due to physical responses to disturbance, an increased potential for vehicle-wildlife collisions, increases in potential harm and injury during construction activities, and promoting an increase in illegal poaching and harassment of wildlife by providing easier access to the cumulative analysis area from the construction and upgrades of area roads. Future activities are likely to be similar and would cumulatively and incrementally reduce the ability of wildlife habitats to support wildlife species at their current levels for the lifetime of oil and gas development and production in the 76-square-mile analysis area. While individual wildlife species may be affected, the overall survivorship of species in the analysis area is not likely to be affected.

4.8.4.2 BLM Sensitive Species

4.8.4.2.1 Greater Sage-grouse

Direct Effects

In the hybrid power alternative, much of the proposed overhead line would be placed in a corridor parallel to an existing overhead line. For this alternative, 151 acres of primarily sagebrush habitat would be disturbed during construction. Approximately 60 acres of disturbance would remain after reclamation.

This slight increase in surface disturbance as compared to the proposed project is associated with the slightly longer length of primary power (0.7 mile longer than the proposed project and buried power alternative). Although the overall length of primary power is greater than the other alternatives, the hybrid power alternative has fewer miles of overhead powerlines than of the proposed project, resulting in less habitat fragmentation. The total length of overhead lines would be reduced from 7.9 miles for the proposed project and 5.7 miles for the hybrid alternative. The hybrid alternative also includes 2.9 miles of buried power however, for a total length of 8.6 miles of primary power compared to 7.9 miles for the other alternatives.

An overhead powerline would connect the NPDU to the PDU to the south and be constructed adjacent to the existing overhead powerline. Sage-grouse habitat would be mowed along the entire corridor during the construction phase. These areas would be reclaimed with a BLM approved seed mix once the project was complete. Power between EPDU and PDU to the west would be eliminated in this alternative. Power supplying most of NPDU would be buried.

Although anti-perching devices would be installed on all new overhead power poles, there would be less potential perching surfaces for raptors that could prey on sage-grouse.

As with the buried power alternative, increased human activity associated with this alternative would be slightly greater than for the proposed project due to the difference in visual inspections of overhead powerlines versus closer inspection and maintenance for sectionalizing boxes and switch gear. Human disturbance, including construction, road use, and noise from project facilities, may result in adverse effects to sage-grouse, particularly during the breeding season. The effects to sage-grouse from construction activities and increased access into the project area would be the same as described for the proposed project.

Indirect Effects

The implementation of the hybrid power alternative would eliminate the effects of some aboveground utilities especially in the NPDU a decrease of 2.9 miles of overhead power from the proposed project. This would result in a decrease in habitat fragmentation caused by above ground power utilities and a likely reduction in predation of nesting hens and chicks within 2 miles of known leks near the NPDU. Long term effects would include the loss of some sagebrush habitat due to the clearing of the buried power corridor during trenching activities to bury the line. There may be long term impacts to sagebrush dependent species because sagebrush recovery times require approximately 30 years from the time that the disturbance has ended. As with the proposed and buried power alternative, an increase in traffic for the life of the project could result in an overall degradation of habitat as well. Wells and infrastructure located within sagebrush habitat would result in direct habitat loss. Sage-grouse avoidance of these facilities and human activities would increase indirect habitat loss. Roads and pipeline corridors, well houses and sectionalizing cabinets may provide corridor, shelter and den sites for ground predators and increase predation pressure on sage-grouse.

Power outages during the winter months may involve more disturbances to wintering habitat along the buried power segments of the hybrid alternative if lines need to be excavated to repair an outage.

Cumulative Effects

Cumulative impacts associated with the hybrid power alternative would include the removal of sagebrush and grasses along the entire 25 foot wide corridor where the buried powerlines would be installed. The entire sagebrush plant including the root system would be removed during the installation of the buried power. A BLM approved reclamation seed mix would be used in replanting the 25 foot corridor, but mature stands of sagebrush would take approximately 30 years to reach pre-construction conditions. This

could impact sagebrush dependent BLM sensitive species discussed further in the next section. If temporarily displaced during construction, suitable habitat for these species does exist adjacent to the proposed activities.

Other surface disturbing activities such as the construction of well pads, access roads, and associated pipelines would be the same as with the proposed project discussed above.

4.8.4.2.2 Other BLM Sensitive Species

Direct and Indirect Effects

For all other BLM sensitive species in the project area, project-related activities have the potential to directly injure or kill individuals, or destroy or fragment habitat, particularly sagebrush habitat. Direct effects to sensitive species that utilize sagebrush habitat (ferruginous hawk, greater sage-grouse [see above analysis], sage thrasher, Brewer's sparrow, sage sparrow, pygmy rabbit, swift fox, dwarf shrew) would include the loss of potential nesting, wintering, and foraging habitats. The increase in surface disturbance would open up areas dominated by sagebrush potentially creating open habitat and grass- and forb-dominated areas for species that prefer grassland/open habitat (e.g. mountain plover, long-billed curlew, burrowing owl, loggerhead shrike, white-tailed prairie dog). Other direct and indirect impacts are the same as those previously described in the wildlife section.

In the hybrid alternative, new overhead power in segments 1 and 5 would pose new threats of habitat fragmentation due to raptor predation, electrocution, and/or collisions as described in the proposed project. In the areas of proposed overhead line, impacts to sensitive species in the short term could be temporary displacement from suitable habitats due to increased noise levels and visual disturbances and increased predation within 0.5 mile each side of the line (BLM 2008d) for small mammals, songbirds, and sage-grouse. According to observations from past wildlife surveys there are no known locations for mountain plover, burrowing owl, white-tailed prairie dog, or pygmy rabbit in segments 1 and 5. A sage-grouse lek currently exists within 2 miles of the proposed overhead powerline in segment 1. In the long term, new overhead powerlines, even with anti-perching devices, are likely to provide new perches and foraging opportunities for sensitive avian species like the ferruginous hawk and loggerhead shrike.

However, new overhead power in segment 3 could create species impacts due to raptor predation, electrocution, and/or collision. The placement of the overhead line along an existing powerline corridor (segment 3) however, would greatly reduce negative impacts associated with the overhead power. In this segment, the estimated habitat fragmentation due to raptor predation of up to 0.5 mile on each side of the overhead line would not represent new fragmentation to the existing sagebrush habitat, but perhaps an extension due to additional perch sites. There is currently an existing sage-grouse lek within 0.5 miles of the existing and proposed overhead line, as well as pygmy rabbit burrows and habitat.

Buried primary power in the hybrid alternative in segments 2 and 4 (where there are currently no overhead lines) would fragment habitat for an estimated 25 foot width, but all fragmentation due to raptors hunting from overhead powerline structures would be eliminated. Sectionalizing cabinets and a surrounding fence placed every 1,200 feet, and switchgear boxes at each stepdown from primary to secondary power, but this still represents a significant decrease in overall habitat fragmentation and collision hazards as compared to the proposed project. White-tailed prairie dogs, mountain plovers, burrowing owls, and greater sage-grouse in particular would benefit from the hybrid alternative and from elimination of overhead powerlines in these two segments.

There are temporary or permanent water bodies that may be inhabited by sensitive amphibian species (Great Basin spadefoot, boreal toad, and spotted frog) in the project area; however, no surface disturbance associated with the proposed project is proposed in wetland areas. While amphibians are known to use

upland sites adjacent to wetland habitat seasonally, there is no surface disturbance proposed in proximity to known wetland sites, and no direct impact.

Cumulative Effects

The cumulative effects analysis area for all BLM sensitive species addressed is the project area with the exception of sage-grouse. Surface disturbing activities associated with natural resource exploration and development, include the construction of two-track roads, exploration pits, wellpads, and pipeline and powerline corridors. The 151 acres of proposed project-related disturbance and future unquantified vegetation losses would result in a further cumulative loss of vegetation in the analysis area, mostly in the sagebrush habitat type. While this loss of habitat could impact sagebrush dependent species such as the sage-grouse, sage thrasher, loggerhead shrike, Brewer's sparrow, sage sparrow, dwarf shrew, pygmy rabbit, and swift fox, the 0.31 percent loss in the 76-square-mile analysis area would be very small relative to the existing surface disturbance. For sage-grouse, approximately 0.004 percent of the expanded 7-mile buffer analysis area would be affected, which is negligible compared to existing surface disturbance.

Cumulative impacts to BLM special status species would be similar in nature to those discussed above for general wildlife. However, given their ongoing habitat losses, sensitivity to disturbance, and declining population numbers, special status wildlife species would likely be more sensitive than other more common species to impacts related to development in the analysis area. Cumulative effects of ongoing activities may have already resulted in displacement of some species despite protective measures. Past, present, and reasonably foreseeable future activities would not vary notably from those described for the proposed project. Of these activities, livestock and wild horse grazing, and recreational use (hunting in particular) would be most affected by habitat removal.

The hybrid alternative could contribute to future development by providing the infrastructure (roads, pipelines, overhead powerlines) for future use. Additional cumulative effects associated with future development could include increased powerline collisions, noise displacement, off-road vehicle use, new fence development, and hunting/poaching.

While individuals may be affected, the overall survivorship of BLM sensitive species in the analysis area is not likely to be effected.

4.9 Transportation

This section discusses the direct, indirect, and cumulative effects of the proposed project and no action alternatives on transportation. The resource analysis area for transportation is the project area and main highways that would be used to access the project area.

4.9.1 No Action

Under the no action alternative, the lessee would be denied their legal rights to explore and develop the federal oil and gas leases on valid leases that have been obtained by the lessee in the three units, and the coordinated plan of development described under the proposed project would not be approved. No effects to the transportation network and traffic in the project area would occur if the proposed wells are not drilled.

For cumulative effects under the no action alternative, the plan of development for the Pappy Draw Project described under the proposed project would not be approved, and would not contribute to cumulative effects on transportation from past, ongoing, or reasonably foreseeable activities or events as described under the proposed project and the alternatives.

4.9.2 Proposed Project

Direct and Indirect Effects

The proposed project may directly or indirectly affect federal and state highways, county roads, BLM roads, and may cumulatively affect the transportation system in the region. These potential effects are discussed below.

Federal and State Highways

The project would increase the volume of traffic on highways that provide access to the project area and on county and operator-maintained roads in the project area. These increases would be caused by movement of project-related workers, equipment, and materials to and from the project area for drilling, field development, well service, field production, maintenance, and reclamation.

Drill rigs, water trucks, and other heavy equipment would be transported to the project area and would remain until drilling is completed. Materials and supplies would be delivered weekly and stockpiled in the project area at a staging location. Drilling and completion crews and other personnel, except drilling engineers, would commute to the project area daily. Drilling engineers would reside at the drill site in a mobile home during the work week.

The average daily traffic associated with the construction phase (40 workers, one round trip per day) would increase traffic by less than 2 percent compared with current traffic levels on US 287/WY 789 from Lamont to Rawlins. During this phase, vehicle traffic would include heavy equipment (such as mobile drilling rigs, bulldozers, graders, track hoes, trenchers, and front-end loaders) and heavy- and light-duty trucks. Based on these assumptions and estimates, the incremental increase in area traffic associated with the proposed project would not cause substantial deterioration of level of service for US 287/WY 789. Because the project traffic would cause a relatively small increase and would be of short duration (7 to 14 days per well), the drilling and field development phase would not likely cause a measurable increase in accident rates on federal and state highways.

The onsite workforce associated with routine production and maintenance activities would be less than 10 workers. During this phase, most vehicle traffic would be associated with onsite maintenance and monitoring activities and would likely consist of four-wheel-drive pickup trucks. The traffic associated with the production and maintenance phase of the project would cause an increase in traffic of less than 1 percent compared with current traffic levels. Based on the relatively small increase in traffic during the production and maintenance phase, the project would not likely cause substantial road deterioration. During the production and maintenance phase, the probability of an increase in accident rates that could be attributed to the project would be negligible.

County Roads

The project would increase traffic on the Fremont and Sweetwater County roads that provide access to the project area. The primary access is from the County Road 22 - Wamsutter Road in Sweetwater County, which is designated as Crooks Gap Road in Fremont County (Crooks Gap Road is used in this analysis). The relatively small, short-term increase in traffic would not likely cause substantial deterioration of the roads or increases in accidents. The primary effects of traffic related to the proposed project on county roads would be accelerated requirements for maintenance. EnCana would be responsible for constructing and maintaining new and improved roads in the project area; therefore, no fiscal effects related to roads are anticipated for Fremont or Sweetwater Counties. If the proposed project is viable, it would generate substantial revenues for Fremont and Sweetwater Counties, as described in the Socioeconomics section. These revenues would offset any costs associated with accelerated maintenance on county roads.

Increased traffic may raise the potential for accidents between vehicles and livestock or wildlife, although the slower speeds required by the condition of county roads would minimize the frequency of collisions.

BLM Roads

Chapter 2 describes the measures proposed by EnCana to develop the transportation network necessary to access wells and ancillary facilities in the project area. A combination of 6.8 miles of existing BLM roads and 7.4 miles of proposed roads would be used to access the project facilities. Construction of new roads would require a maximum disturbance width of 35 feet. The primary effects of traffic related to the proposed project on BLM roads would be accelerated requirements for maintenance. EnCana would be responsible for constructing and maintaining new and improved roads in the project area; therefore, no fiscal effects related to roads are anticipated for the BLM.

Cumulative Effects

The cumulative effects analysis area for transportation includes Fremont and Sweetwater Counties. Continued oil and gas development in Fremont and Sweetwater Counties would cause increased traffic on affected segments of I-80 and US 287/WY 789. Traffic associated with other activities, such as mining, livestock grazing, and recreation, is likely to remain similar to current conditions or increase minimally. The condition of these highways is adequate to accommodate existing levels as well as projected increases of traffic, as shown in **Table 3-17**.

Currently known cumulative effects on Fremont and Sweetwater County Roads (County Road 22 and Crooks Gap Road) would be limited to traffic associated with grazing, mining, recreation, and oil and gas exploration and development. The increased traffic associated with the proposed project would accelerate maintenance requirements; however, the revenues generated, which are described in the Socioeconomics section, should greatly offset associated costs.

4.9.3 Buried Power Alternative

Direct and Indirect Effects

Under the buried power alternative, the direct and indirect effects on transportation from project activities would not be expected to vary from the effects described for the proposed project.

Cumulative Effects

The cumulative effects for the buried power alternative would not be expected to vary from those described for the proposed project. The contribution to cumulative effects to transportation resulting from any alternative would be short-term and small compared with the effects from other ongoing and foreseeable management activities.

4.9.4 Hybrid Power Alternative

Direct and Indirect Effects

Under the hybrid power alternative, the direct and indirect effects on transportation from project activities would not be expected to vary from the effects described for the proposed project.

Cumulative Effects

The cumulative effects for the hybrid power alternative would not be expected to vary from those described for the proposed project. The contribution to cumulative effects to transportation resulting from any alternative would be short-term and small compared with the effects from other ongoing and foreseeable management activities.

4.10 Recreation

This section discusses the direct, indirect, and cumulative effects of the proposed project alternatives on recreation. The analysis area for recreation is the project area that includes the three Pappy Draw Units.

4.10.1 No Action

Under the no action alternative, the lessee would be denied their legal rights to explore and develop the federal oil and gas leases on valid leases that have been obtained by the lessee in the three units, and the coordinated plan of development described under the proposed project would not be approved. Effects to recreation uses such as hunting, and the visual impacts to recreation uses such as hiking on the Continental Divide National Scenic Trail would not occur under the no action alternative. No additional effects on recreational resources or use would occur if the proposed wells are not drilled.

For cumulative effects under the no action alternative, the plan of development for the Pappy Draw Project described under the proposed project would not be approved, and would not contribute to cumulative effects on recreation from past, ongoing, or reasonably foreseeable activities or events as described under the proposed project and the alternatives.

4.10.2 Proposed Project

Direct & Indirect Effects

Direct effects to recreational use of the project area would involve a temporary displacement of some individual recreationists particularly during construction and drilling. These effects would primarily be short-term during the 2- to 3-month construction phase. Disturbances would diminish substantially after drilling and construction are completed. Considering the abundance of nearby similar recreational opportunities for hunting, camping, and ORV use, minimal effects on the recreational experience are expected from this project.

Most recreational use of the project area is associated with hunting. Some hunters may perceive project activities as displacing game species and creating an environment that detracts from the hunting experience. Displacement would be highest during the general deer and elk season when the most hunters are in the area. The proposed drilling schedule would limit displacement to one season. Furthermore, hunters could relocate to other areas outside the project area.

Some long-term displacement of hunters and other recreationists may also occur. Human access and activities would increase with the improved and new access roads. Conflicts between project vehicles and recreation traffic would be minimized by posting warning signs, implementing operator safety training, and requiring project vehicles to adhere to safe speed limits. Overall, effects on recreation would be minimal because of the short-term nature of the construction phase and the concentrated locations of these activities.

Undisturbed landscapes and solitude are important to some recreationists. Project disturbances that impair the characteristic landscape could also contribute to a decline in the recreational experience for these visitors. The recreational experience could be less satisfying, than under the conditions described in Chapter 3.

Users of the Continental Divide National Scenic Trail (CDNST) would not be directly affected by the proposed project because the trail does not cross the project area. The proposed project may slightly alter the visual landscape as seen from the trail; however, the proposed activities are not out of character for the surrounding area and would comply with the established VRM rating for the area. Any indirect effects to trail users are expected to be minimal because of the distance between the trail and project area, and the

low number of users on this portion of the trail. All surface disturbing activities and facilities within view of the CDNST will be located and developed using the BLM's visual contrast process. Additional measures to reduce impacts will be identified through the contrast rating process.

Indirect impacts would occur if during construction and operation activities the public chooses other areas that provide similar recreation opportunities. Other indirect impacts would include increased traffic and human presence because of increased access into the area, increased noise, and changes to the visual landscape, making the project area a less desirable place to recreate.

Cumulative Effects

The cumulative effects analysis area for recreation is the project area and the surrounding seven-mile buffer area, which includes many recreational opportunities including fishing, camping, hunting, picnicking, wildlife viewing, and driving for pleasure. Existing activities, such as oil and gas exploration and development, mining, utility and transportation corridors, and livestock grazing, have modified the recreational experience in this area. Similar activities would likely continue in the future.

The recreation opportunities in the cumulative effects analysis area are similar to the opportunities available in the project area, and consist primarily of hunting. The CDNST crosses through the north. The cumulative effect to recreational opportunities is expected to be minimal because of the wide availability of these activities elsewhere in the LFO area. There may be some temporary displacement of hunters and recreationists during the short-term construction and drilling periods. Some long-term displacement of hunters and non-consumptive users may occur, and there may be reduced levels of satisfaction for any who might continue to use the area.

The potential for degradation of the quality of recreational resources in the area would increase if the current accelerated pace of drilling and field development in the Great Basin continues. Levels of dissatisfaction among some residents and area visitors would increase correspondingly if area residents perceive that recreational resources have been degraded by these activities.

4.10.3 Buried Power Alternative

Direct & Indirect Effects

Impacts from the buried power alternative to the recreation resource would be similar to those described for the proposed project for hunting opportunities. However, the visual impact of the buried powerlines would be lower than the impact of the proposed project, so there would be a smaller effect to the sense of isolation and solitude valued by some recreationists who visit the area. Adverse impacts to the recreation resource associated with the buried power alternative would be lower, in both the short term and the long term, than the proposed project.

Cumulative Effects

The cumulative effects for the buried power alternative would not be expected to vary substantially from those described for the proposed project; although the effect would be smaller from the alternative because of the reduced visual impact to recreationists on the CDNST when compared to the proposed project. The contribution of any alternative to cumulative effects to recreation would be short-term and small compared with the effects from other ongoing and foreseeable management activities.

4.10.4 Hybrid Power Alternative

Direct & Indirect Effects

Impacts from the hybrid power alternative to the recreation resource would be similar to those described for the proposed project for hunting opportunities. The visual impact of the overhead powerline between

the electric substation at Green Mountain Substation and the NPDU, as assessed in 4.10 –Visual Resources, is identical for the proposed project and the hybrid alternative; therefore, there would be an identical effect to the sense of isolation and solitude experienced by hikers on the nearby CDNST. Adverse impacts to the recreation resource associated with the hybrid power alternative would be slightly lower, in both the short term and the long term, than the proposed project due to the portions of the project that are buried; but greater than the buried power alternative.

Cumulative Effects

The cumulative effects for the hybrid power alternative would not be expected to vary substantially from those described for the proposed project. The contribution of any alternative to cumulative effects to recreation would be short-term and small compared with the effects from other ongoing and foreseeable management activities.

4.11 Visual Resources

This section discusses the direct, indirect, and cumulative effects of the proposed project and the alternatives on visual resources. The resource analysis area is the project area and the surrounding 7-mile buffer, which includes roads and recreational use areas that provide views of the proposed project and alternatives.

4.11.1 No Action

Under the no action alternative, the lessee would be denied their legal rights to explore and develop the federal oil and gas leases on valid leases that have been obtained by the lessee in the three units, and the coordinated plan of development described under the proposed project would not be approved. No additional effects on visual resources would occur if the proposed wells are not drilled. Potential future mineral exploration and development in the project area would likely cause adverse impacts to visual resources as viewed from roads used by the public, and recreation areas such as the nearby CDNST.

For the no action alternative, the plan of development for the Pappy Draw Project described under the proposed project would not be approved, and would not contribute to cumulative effects on visual resources from past, ongoing, or reasonably foreseeable activities or events as described under the proposed project.

4.11.2 Proposed Project

Direct & Indirect Effects

Impacts from Construction

Short-term effects to the visual character of the landscape would result from wellpad construction, well drilling, and associated construction and installation of ancillary facilities, such as access roads, powerlines, and pipelines. Construction and installation of pipelines would immediately follow construction of access roads and wellpads, and would coincide with the completion of well drilling.

The drill rig is the most visible feature of gas exploration and drilling activities. The drill rig height of more than 100 feet would be a pronounced vertical linear contrast with the surrounding predominantly natural landscape. In addition, drill rigs are generally painted a color that contrasts sharply with the landscape. The typical CBMG well would require 3 days to drill. Drilling activities would typically occur 24 hours per day.

Temporary disturbances would not conflict with VRM Class IV objectives, which only address modifications to the landscape from long-term facilities. Construction disturbances for each wellpad and associated access road would occur over a period of less than 2 months. Following completion of facility installation, temporary disturbance areas would be reclaimed to pre-construction conditions. Only permanent disturbances associated with operations and maintenance of the facilities would remain following restoration.

Impacts from Operation

Long-term effects for the project would result from the addition of permanent structures to the landscape and from the operation of facilities. Project long-term effects would include the development of wellpads and new two-track or all-weather access roads, improvements to existing access roads, and installation of CBG facilities. Effects from long-term activities would occur over the production life of CBMG wells in the project area. Long-term impacts to the visual quality of the landscape would result from the addition of the overhead powerline pole structures into the characteristic landscape.

CBNG development would alter the physical setting and visual quality landscape to some degree, as viewed from the county and BLM roads within and in close proximity to the project area, and from viewpoints on the CDNST. The CDNST is the only sensitive viewing area that has been identified for the project area.

The resulting landscape from CBNG development in the project area, as viewed from county and BLM roads, would be rural/industrial in character. As viewed from the CDNST, production facilities would not be visible at most surface locations because most of the facilities are blocked from view by a northwest-southeast trending ridge. Also, CBNG facilities would be visually subordinate to the landscape in foreground-middleground distance zone because wellpad clearings and road disturbances would be difficult to discern from the surrounding landscape in middleground views of more than 1.5 to 2 miles from viewpoints.

The results of a viewshed analyses (based on topographic analysis and prepared using geographical information system [GIS] technology) show that the visible portion of the project area is northeast of the ridge, between 0.8 and 2 miles from the nearest portion of the CDNST. Proposed facilities that would be visible from the CDNST include overhead electric powerlines in an existing pipeline corridor between the Green Mountain Substation and the NPDU. The facilities would be within the foreground-middleground distance zone of the CDNST, and would be visible from all locations on the trail that provide an unimpeded view of the facilities.

The single wood poles of the overhead powerline would introduce into the viewshed of the CDNST straight, vertical lines of individual poles placed at regular intervals along the ROW. The individual poles within the linear transmission line would be erected at 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. The span between the poles would be determined by the topography. In addition, there may be a glare when sunlight is reflected from the conductors. While the addition of the powerline into the natural-appearing landscape of the project area as viewed from the CDNST would constitute a visual intrusion, the wood poles would not be a significant element of the landscape, as they would be located at a distance of more than 0.8 mile from the trail, and would be small in scale relative to the surrounding landscape.

The long-term intrusion of CBNG facilities, including the aboveground powerline, would not conflict with VRM Class IV objectives, which provide for management activities which require major modification of the existing character of the landscape; however, requirements for the mitigation of visual

resources would be included as design features in the COAs. An example would be painting facilities a color such as Covert Green to minimize the effects.

Indirect effects from the proposed project 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. There is potential for recreational uses of the nearby CDNST to be affected by visual changes in the project area; however, the effect for other recreation uses such as hunting would be negligible, as overall recreation use of the area is low and hunting activities are less likely to be affected by changes in the visual landscape than multi-use trail activities.

Cumulative Effects

The cumulative effects analysis area for visual resources is the project area and the surrounding 7-mile buffer. Existing visual quality in the project area and adjacent lands has already been affected by ongoing uranium prospecting and development, including road building and pipeline construction, as well as other mineral exploration, including oil and gas. Existing, proposed, and reasonably foreseeable development would add to the level of effects to visual resources in the analysis area. The composite experience of people traveling through the area, particularly on back roads, is a modified landscape. Contrasts in line, form, color, and texture from development may dominate the viewer's experience. These conditions would increase the likelihood that viewers would be dissatisfied with the visual component of the recreation experience. Hikers and other users of the CDNST, which is within the cumulative effects analysis area, may notice project activities, particularly during drilling. Recreational users of the Green Mountain area, which is outside the cumulative effects analysis area, are not likely to notice project activities because of the distance between Green Mountain and the location of the proposed activities. However, the cumulative effects of the proposed project and other activities, such as grazing, recreation use, and conventional oil and gas development, on visual resources would be consistent with the current VRM Class IV designation.

4.11.3 Buried Power Alternative

Direct & Indirect Effects

Impacts from the buried power alternative to visual resources would be similar to those described for the proposed project for aboveground facilities such as production wells and roads however, the visual impact of the buried powerlines would be lower than the impact of the proposed project, so there would be a smaller impact to the views experienced by hikers on the CDNST. Adverse impacts to visual resources associated with the buried power alternative would be lower, in both the short term and the long term, than the proposed project.

Cumulative Effects

Cumulative visual effects to the landscape from past and current projects include uranium exploration, oil and gas exploration and development, mining, roads, utility corridors, livestock grazing, and recreational use, as described in the Affected Environment – Visual Resources. The incremental effect of the buried power alternative in addition to existing and foreseeable disturbance in the cumulative analysis area would be small, but would be a noticeable contribution to the ongoing change from a predominantly natural and rural landscape to a rural landscape with a noticeable industrial component. The incremental effect of the alternative would be less than described for the proposed project, because the buried powerlines would be a less noticeable intrusion into the natural landscape than the overhead powerlines of the proposed project.

4.11.4 Hybrid Power Alternative

Direct & Indirect Effects

Impacts from the hybrid power alternative to visual resources would be similar to those described for the proposed project for aboveground facilities such as well and roads. The visual impact of the overhead powerline between the electric substation at Green Mountain Substation and the NPDU is identical for the proposed project and the hybrid power alternative; therefore, there would be an identical impact to the scenic quality of views currently experienced by hikers on CDNST. For the remainder of the project area, adverse impacts to visual resources associated with the hybrid power impact would be slightly lower, in both the short term and the long term, than the proposed project because the buried powerlines are less intrusive in the landscape than aboveground powerlines.

Cumulative Effects

Cumulative visual effects to the landscape from past and current projects include uranium exploration, oil and gas exploration and development, mining, roads, utility corridors, livestock grazing, and recreational use, as described in the Affected Environment – Visual Resources. The incremental effect of the hybrid power alternative in addition to existing and foreseeable disturbance in the cumulative analysis area would be small, but would be a noticeable contribution to the ongoing change from a predominantly natural and rural landscape to a rural landscape with a noticeable industrial component. The incremental effect of the alternative would be less than described for the proposed project, because the buried powerlines would be a less noticeable intrusion into the natural landscape than the overhead powerlines of the proposed project.

4.12 Wild Horses

This section discusses the direct, indirect, and cumulative effects of the no action, proposed action, buried power alternative and hybrid power alternative on wild horses. The resource analysis area is the project area of PDU, NPDU, and EPDU which is roughly equal to 48,350 acres or 76 square miles. The cumulative effects analysis area for this resource is the project area and a 7-mile buffer surrounding the project area. This cumulative effects analysis area encompasses 516 square miles.

4.12.1 No Action

Under the no action alternative, the proposed exploration and development project would not be approved and would not proceed. No new direct or indirect effects associated with this project would occur to wild horses. Conventional oil and gas and CBNG, ranching, recreation, and development would continue on state, private, and federal lands near the project area. Wild horse grazing and associated impacts would likely continue at their present level of use.

The no action alternative would not contribute to cumulative effects on vegetation from past, ongoing, or reasonably foreseeable activities or events as described under the proposed project.

4.12.2 Proposed Action

Direct Effects

Surface disturbance associated with implementation of the proposed project would cause vegetation loss and fragmentation resulting in a reduction in the availability of potential forage for wild horses. Construction phase disturbance would initially cause a loss of 147 acres of potential available forage for wild horses, after interim reclamation 60 acres would be lost. This represents a loss of only 0.30 percent of the sagebrush habitat in the project area for the life of the project. BLM estimates that 6 percent of the

available forage in the Green Mountain Grazing Allotment is allocated for wild horses. The available forage allocated to wild horses in the Crooks Gap Grazing Allotment is not known. Wild horses are a large and mobile species that would be less susceptible to habitat fragmentation and direct harm due to construction activities. However, construction activities may disrupt the behavior of wild horses causing individuals to avoid otherwise suitable habitats as described in indirect effects below. Based on the relatively localized and concentrated nature of the proposed surface disturbance, wild horses would be expected to use other undisturbed suitable habitats in the project area without ill effects to their condition or survivorship. Once the above ground powerline is constructed, the structures themselves are not likely to cause avoidance or fragment habitat. Project design features identified in Section 2.5.6; Conditions of Approval in the APDs; and Wyoming standard mitigation guidelines; lease stipulations; decisions in the Lander RMP (BLM 1986a) associated with air quality, soils, surface, and groundwater and vegetation could effectively minimize the impacts to wild horses.

Indirect Effects

Indirect effects include a potential increase in wild horse and vehicle collisions due to the increases in the volume and type of project-related vehicle traffic and the potential introduction and spread of noxious weeds in the project area that may affect forage availability and quality. Several measures in addition to design features included for other resources in Chapter 2 would be included in the project to minimize collisions, including posting speed limits and warning signs on project roads, installing telemetry devices to reduce the frequency of visits required to project facilities, and providing season dates when wild horses may be encountered in the project area.

Surface disturbance and increased human activity could result in avoidance of the project area and may prevent or discourage access to current foraging areas and/or water resources or lead to a disruption of seasonal migration routes.

Cumulative Effects

The cumulative effects analysis area for this resource is the project area and a 7-mile buffer surrounding the project area. The primary past and current effects to wild horses include habitat loss and fragmentation, displacement caused by roads, oil and gas development, and mining; vehicle collisions; and establishment and spread of noxious weeds.

The proposed action would contribute an additional 147 acres of construction disturbance to vegetation and 60 acres of long-term disturbance; however, this disturbance would account for only 0.04 percent surface disturbance in the analysis area. The total cumulative disturbance in the cumulative analysis area is not available, by it is likely that the disturbance accounts for a relatively small incremental increase of the total cumulative disturbance of available forage from other past, present, and foreseeable surface disturbing activities that include oil and gas production facilities, uranium mining, and transportation and utilities infrastructure.

Overhead powerlines and access roads associated with the proposed action could contribute to future development in the project area, providing infrastructure (particularly roads and utilities) for future development such as conventional and natural gas development, mining, and ranching (i.e. wells for stock ponds) which could lead to increased surface disturbance and human activity. Where oil and gas development and associated infrastructure have been developed, habitat fragmentation might lead to a disruption of seasonal migration routes, and may prevent or discourage access to current foraging areas and/or water resources. Because the project area lies between the Green Mountain HMA and the Crooks Mountain HMA, there is the potential to interrupt wild horse travel between the two HMAs which could lead to the potential loss or exchange of genetic material from one HMA to the other (BLM 2008d).

Past and current activities have likely caused increases in local vehicle traffic and contributed to the potential introduction of noxious weeds. The proposed project would result in a temporary increase in the volume and frequency of vehicle traffic in the project area. These project-related effects would be incremental to those effects associated with past and other current activities. Because natural resource exploration and development, livestock grazing, and recreational use would likely continue in the project area, these future actions would be expected to contribute to these same effects into the future, although the potential extent of these effects is unknown. These cumulative effects are likely to have a local effect on individual wild horses, but would not likely affect population densities within the respective HMAs.

4.12.3 Buried Power Alternative

Direct Effects

Surface disturbance associated with implementation of the buried power alternative would cause vegetation loss and habitat fragmentation resulting in a reduction in the availability of potential forage for wild horses. Construction phase disturbance would initially cause a loss of 156 acres of potential available forage for wild horses, after interim reclamation 61 acres would be lost. This represents a loss of only 0.13 percent of potential available forage in the project area for the life of the project. Within this disturbance estimate, switchgear boxes and sectionalizing cabinets would be installed above ground and would be fenced to prevent damage from wild horses.

Project design features identified in Section 2.5 Chapter 2; Conditions of Approval in the APDs; and Wyoming standard mitigation guidelines; lease stipulations; decisions in the Lander RMP (BLM 1986a) associated with air quality, soils, surface, and groundwater and vegetation could effectively minimize the impacts to wild horses.

Indirect Effects

Indirect effects include a potential increase in wild horse and vehicle collisions due to the increases in the volume and type of project-related vehicle traffic and the potential introduction and spread of noxious weeds in the project area that may affect forage availability and quality.

Cumulative Effects

The cumulative effects for the buried power alternative would not be expected to vary significantly from those described for the proposed project with the exception of available infrastructure. In the buried power alternative, electrical lines would not be available for additional customers to tie into for future development such as conventional and natural gas development, mining, and ranching (i.e. wells for stock ponds). Any potential need for electric power in the cumulative analysis area would therefore require the development of additional overhead lines, which could lead to increased surface disturbance and human activity which could disrupt wild horse behavior. Cumulative effects from the loss of potential available forage on wild horses from this alternative relative to the proposed project would be negligible when compared with all other past, present, and reasonably foreseeable future activities, and would account for an estimated 0.02 percent of the cumulative assessment area.

4.12.4 Hybrid Power Alternative

Direct Effects

Surface disturbance associated with implementation of the hybrid power alternative would cause vegetation loss and habitat fragmentation resulting in a reduction in the availability of potential forage for wild horses. Construction phase disturbance would initially cause a loss of 151 acres of potential available

forage for wild horses, after interim reclamation 60 acres would be lost. This represents a loss of only 0.12 percent of potential available forage in the project area for the life of the project.

Indirect Effects

Indirect effects include a potential increase in wild horse and vehicle collisions due to the increases in the volume and type of project-related vehicle traffic and the potential introduction and spread of noxious weeds in the project area that may affect forage availability and quality.

Cumulative Effects

Total vegetation loss associated with construction phase disturbance (151 acres) of the hybrid alternative would account for 0.046 percent vegetation loss in cumulative analysis area (516-square miles). Disturbance remaining after interim reclamation (62 acres) would account for 0.021 percent potential available forage loss in the cumulative analysis area. Past, present, and reasonably foreseeable future activities would not vary notably from those described for the proposed project.

4.13 Cultural Resources

This section discusses the direct, indirect, and cumulative effects of the proposed project and no action alternatives on cultural resources. The resource area for cultural resources is the project area.

4.13.1 No Action

Direct & Indirect Effects

Under the no action alternative, the lessee would be denied their legal rights to explore and develop the federal oil and gas leases on valid leases that have been obtained by the lessee in the three units, and the plan of development described under the proposed project would not be approved. No effects on historic properties would occur if the proposed wells are not drilled. Potential future mineral exploration and development in the project area could affect cultural resources in the project area.

Cumulative Effects

Cumulative effects to cultural resources from the no action alternative would not be an additional, incremental effect to past, current, and foreseeable actions and activities in the cumulative analysis area. The cumulative impact without the Pappy Draw Plan of Development would continue as described in the Affected Environment – Cultural Resources.

4.13.2 Proposed Project

Direct & Indirect Effects

The proposed project may adversely affect any historic properties that are in the area of potential effects (APE). Direct and indirect adverse effects to historic properties can be prevented on a case-by-case basis through avoidance and protection. If it is not feasible to avoid a historic property, mitigation measures such as data recovery will be implemented to minimize adverse effects. Implementation of measures described in Chapter 2 would reduce direct and indirect effects and minimize the loss of cultural resource information. Four historic properties are within the APE of the proposed project. One of the historic properties is in the PDU and three are in the NPDU. No TCPs have been identified that would be affected. Testing for National Register Evaluation is at several sites in the NPDU has been completed and a report submitted to BLM for review (ARCADIS 2008d). One site is recommended as eligible, and avoidance measures are proposed so there will be no impacts to the site and a finding of no effect to historic properties from the proposed project. Avoidance and protection measures will include monitoring of

construction to insure the effectiveness of avoidance measures and to minimize any inadvertent adverse effects.

Direct effects would be caused primarily by construction. Activities that could affect cultural resources include grading for wellpads and associated facilities and construction of roads and pipelines. Unidentified buried sites could be encountered during construction. Monitoring of construction and inspection of open excavations will also be required in areas that have been identified as having the potential to contain undocumented buried cultural materials to minimize inadvertent adverse effects to any such resources. Sites located outside the APE would not be directly affected by construction.

Indirect effects would not cause immediate physical alteration of any historic properties. Indirect effects to historic properties might include alteration of the historic setting of historic properties, unauthorized surface collection of artifacts, such as stone tools or bottles, or erosion caused by surface disturbance. The historic Rawlins-Fort Washakie Road is an eligible resource near the project area. The setting of this historic road includes characteristics that convey the area of significance and period of historic use of the road and contribute to the eligibility of the linear resource. However, the drill rigs and pipeline construction will be temporary visual intrusions on the historic setting and measures will be implemented to minimize the visual effect of more permanent project features such as access roads. The construction and maintenance of new roads will increase access to remote areas, which may increase non-project traffic in the area. This may increase the potential for unauthorized surface collection or inadvertent damage from off-road traffic.

All recommendations are subject to approval and alteration by the LFO archaeologist. In the event that buried cultural materials are discovered during construction, those activities would be halted until a qualified archaeologist visits the site and evaluates the find. If the proposed project is modified, additional cultural resources inventory would be required for any new area of proposed disturbance.

Cumulative Effects

The cumulative effects analysis area for cultural resources includes the project area and a 2-mile buffer. In this area, cultural resources may have been affected by various activities in the past. The proposed project, as well as reasonably foreseeable future activities, would have only minimal cumulative effects to cultural resources because design features would be required by the BLM.

4.13.3 Buried Power Alternative

Direct and Indirect Effects

The anticipated short-term and long-term effects on cultural resources from the buried power alternative would result in an increased chance of directly affecting previously identified buried sites relative to the proposed project. The increased potential effect can be eliminated or reduced through avoidance, monitoring and open trench inspection in those areas with the potential to contain buried cultural materials.

Cumulative Effects

The cumulative effects for the buried power alternative would not be expected to vary from those described for the proposed project for well and roads; however, the effects from burying powerlines would result in an increased potential to disturb. The incremental contribution of the alternative to cumulative effects to cultural resources would be small compared with the effects from other past, present and foreseeable management activities.

4.13.4 Hybrid Power Alternative

Direct and Indirect Effects

The anticipated short-term and long-term effects on cultural resources from the buried power alternative would result in an increased chance of directly affecting previously identified buried sites relative to the proposed project. The increased potential effect can be eliminated or reduced through avoidance, monitoring and open trench inspection in those areas with the potential to contain buried cultural materials.

Cumulative Effects

The cumulative effects for the hybrid power alternative would not be expected to vary from those described for the proposed project for well and roads; however, the effects from burying powerlines would result in an increased potential to disturb. The incremental contribution of the alternative to cumulative effects to cultural resources would be small compared with the effects from other past, present and foreseeable management activities.

4.14 Socioeconomics

This section discusses the direct, indirect, and cumulative effects of the proposed project and no action alternatives on socioeconomics. The resource analysis area for socioeconomics is Sweetwater and Fremont Counties in Wyoming.

4.14.1 No Action

Under the no action alternative, the lessee would be denied their legal rights to explore and develop the federal oil and gas leases on valid leases that have been obtained by the lessee in the three units, the coordinated plan of development described under the proposed project would not be approved. There would be no benefits in the form of royalties and taxes paid to the local, state, and federal governments; and no increases in employment and contributions to local economies from employee payrolls. Demand for CBNG locally and nationally, however, could increase the potential for new proposals for exploration and development of the project area. Future mineral exploration and development in the project area would require a Surface Use Plan and an environmental analysis, including an analysis of the cumulative effects under NEPA.

For cumulative effects under the no action alternative, the plan of development for the Pappy Draw Project described under the proposed project would not be approved, and would not contribute to cumulative effects on socioeconomics from past, ongoing, or reasonably foreseeable activities or events as described under the proposed project and the alternatives. The impacts to the social and economic structures of Sweetwater and Fremont Counties would continue as described for the Affected Environment – Socioeconomics.

4.14.2 Proposed Project

Direct & Indirect Effects

The anticipated socioeconomic effects of the proposed project would be largely positive. Direct effects of the proposed project would be to enhance regional economic conditions and generate revenues from local, state, and federal government taxes and royalties.

The project would involve capital investment in gas wells, injection wells, gathering systems, compression stations, and other field infrastructure. The project would require approximately 40 drilling

and field development workers over a 2- to 3-month period. The onsite work force associated with routine production and maintenance activities would be fewer than 10 individual workers for up the life of the project. The relatively small, short-term drilling and field development workforce would not have noticeable effects on population or demand for temporary housing or local government services.

Development and operation of the proposed project would require goods and services from a variety of local and regional contractors and vendors, the oil and gas service industry, and other industries. Expenditures by EnCana for these goods and services, coupled with employee and contractor spending, would generate economic effects in Fremont, Sweetwater, and Carbon Counties in Wyoming, and the nation as a whole. The project is unlikely to create any indirect jobs (defined as jobs that become available in support industries because of project activities).

Employment, Earnings, and Population

Employment, earnings, and population effects of the proposed project would not be noticeable. Some of the skills and services required for the proposed project are available in the local labor pool, although the recent increase in oil and gas drilling in southwest Wyoming has absorbed much of the available workforce. Of the short-term demand for 40 drilling and field development workers, most would be contractors from other areas in Wyoming, primarily Rawlins and Rock Springs. Given the short duration of the drilling phase (2 to 3 months), it is likely that most non-local workers and their families, if any, would not relocate permanently to Fremont, Sweetwater, and Carbon Counties. The workforce for the project would represent an increase of less than 0.1 percent compared with the current population in the project area. Based on the relatively small workforce and short-term nature of the drilling and field development phase of the project, there would be little or no effects to employment, earning, or population. Area businesses could accommodate the increase in economic activity with existing employees.

During production and maintenance activities, fewer than 10 individual workers would be required for the possible life of the proposed project. Employment, earnings, and population effects would be negligible.

Oil and Gas Production

Successful completion of the proposed project would increase production of CBNG in Fremont and Sweetwater Counties, particularly during the first several years of the project. The total numbers of APDs issued for all oil and gas, including CBNG in 2007, were 171 in Fremont County and 608 in Sweetwater County (WOGCC 2008a). The 16 new gas wells associated with the proposed project would be about 2.1 percent of the current 2007 APD level for both counties. However, the relatively short drilling time and low requirements for infrastructure and labor associated with the proposed wells would not create a substantial increase in drilling activity or employment in either of the counties.

Temporary Demand for Housing

There is increasing demand for temporary housing in Sweetwater, Fremont, and Carbon Counties because of an increasing level of oil and gas development, in addition to population increases from an overall economic growth of the region. The project workforce could experience some difficulty in acquiring sufficient housing for the duration of drilling activities. Successful acquisition of temporary housing may also depend on the construction schedules of other resource development and construction projects that may occur in the counties, as well as seasonal recreation activities such as hunting. Although local communities have taken steps to address housing shortages, no solutions have yet been proposed to alleviate shortages. Non-local workers would attempt to obtain temporary housing as close to the work site as possible, most likely in Bairoil or Lamont. Workers who are not able to secure temporary housing in Bairoil or Lamont are most likely to find accommodations in Rawlins or Rock Springs, Wyoming.

Law Enforcement and Emergency Response

Existing law enforcement and emergency management resources would be adequate to accommodate the proposed project. There would be a relatively small level of demand on the local law enforcement and emergency management resources associated with the proposed development, production, and maintenance.

Fiscal Effects

If the drilled gas wells for the proposed project are successful, the fiscal effects from the facilities developed and the CBNG that could be produced may be considerable. These effects would contribute to the financial well-being of the counties where the gas is produced (Fremont and Sweetwater Counties). Fiscal effects would include increased revenues to the counties, local schools, and roads, in addition to positive fiscal effects to the State of Wyoming and the U.S. Treasury.

Production of CBNG resources in the project area would generate revenues for the United States, the State of Wyoming, and Fremont and Sweetwater Counties. These increased revenues would be realized for the life of the proposed project. The potential economic effect of CBNG development in the project area can be estimated based on assumptions regarding methane production rates, expected gas prices, and the productive life of a well. Because no reliable data for the project area would be available until exploratory drilling is completed, the assumptions presented here for this analysis may not be accurate.

Production rates would vary among wells and for a specific well over the production period, and gas prices are expected to vary substantially over the life of the proposed project. However, to estimate the revenues generated from the proposed project, a fixed gas price and average production rate were assumed over the life of the project. A CBNG price of \$4.25 per mcf was used based on the state forecast for 2005-2010 (CREG 2005) and the average annual gas production rate of 84.6 mmcf per well per year was used based on rates for typical CBNG wells in southwestern Wyoming (UW 2000). Based on these values and assuming the productive life of each successful gas well in the project is 30 years, the sales value of each well would be about \$10.8 million over the life of the project. All 16 gas wells that would be developed are located on federal land. Producing wells on federal leases generate federal royalties. If all of the new wells were productive, the federal royalties would be \$22.9 million. After administrative charges are deducted, half of the federal royalties would be paid to the State of Wyoming and half to the federal government. In addition, the severance tax collected by the State of Wyoming would exceed \$11 million. A portion of these state revenues would be distributed to the counties. Seven wells would be located in Fremont County and 10 wells would be in Sweetwater County. The ad valorem property taxes collected by Fremont County would exceed \$0.8 million and Sweetwater County would collect more than \$1.3 million. The estimated revenues are approximate (in 2005 dollars), based on the defined assumptions, and are intended to indicate the order of magnitude of possible fiscal effects. Actual revenues from the proposed project may vary substantially from these estimates.

Other Economic Effects

Temporary and long-term disturbances could cause a small reduction in the amount of land available for grazing. The effects of the project on the hunting and recreation economy in Fremont and Sweetwater Counties would not be noticeable because of the short-term nature of drilling and field development. In addition, effects would be limited based on the potential for hunters and recreationists to use other nearby areas.

Potential indirect effects of the project would involve the inducement of population and economic growth from the influx of new workforce and the stimulation of dollars introduced into local economies from project expenditures and payroll. It is anticipated that the majority of the workforce currently resides within commuting distance of the project area; therefore any effect from in-migration of workers is likely

to be negligible. Project expenditures are likely to be negligible relative to the economy of the affected counties.

Cumulative Effects

The cumulative effects analysis area for socioeconomics includes Carbon, Fremont, and Sweetwater Counties. Southwest Wyoming is currently experiencing an increase in the pace and level of oil and gas development. Drilling and field development are occurring near the project area. Although this surge in development would create increased employment, income, and tax revenues in the region, it would also raise the demand for housing and local and state government facilities and services.

Communities near the project area, such as Rawlins and Rock Springs, are still below peak population levels of the early 1980s and have infrastructure and housing in place to accommodate some growth in population. Neither the relatively small, short-term drilling and field development workforce nor the minimal long-term operations employment would add appreciably to cumulative demand for housing and local government services in the area. Revenues generated by the proposed project should offset costs associated with increased demand on county government services.

The cumulative effects of increased drilling and field development in and near the project area would generate substantial revenues for the federal government; State of Wyoming; and Carbon, Fremont, and Sweetwater Counties. Federal royalties would be the primary direct source of increased revenues for the federal government, and approximately half of the federal royalties would be paid to the state. State revenues also would increase because of state mineral severance tax revenues. Portions of both the state's share of federal mineral royalties and the state mineral severance taxes would be distributed to the counties, roads, schools, and other accounts. Annual ad valorem property taxes on mineral production would be a substantial direct source of increased revenues for both counties. In addition, some state and county revenues would come from sales and use taxes on goods purchased during development.

4.14.3 Buried Power Alternative

Direct & Indirect Effects

The effects to the social and economic environment of Sweetwater and Fremont Counties under the buried power alternative would not be expected to vary from those described for the proposed project. New road infrastructure associated with the alternative could contribute to future development in the project area, however, additional customers would not be able to tie into buried powerlines for future development such as conventional and natural gas development, mining, and ranching (i.e. wells for stock ponds).

Cumulative Effects

The cumulative effects for the buried power alternative would not be expected to vary from those described for the proposed project. The contribution of any alternative to cumulative effects to socioeconomic resources would be small compared with the effects from other ongoing and foreseeable management activities.

4.14.4 Hybrid Power Alternative

Direct & Indirect Effects

The effects to the social and economic environment of Sweetwater and Fremont Counties under the hybrid power alternative would not be expected to vary from those described for the proposed project. Road and overhead powerline infrastructure associated with the hybrid power alternative could contribute

to future development in the project area, however, additional customers would not be able to tie into buried powerlines for future development such as conventional and natural gas development, mining, and ranching (i.e. wells for stock ponds).

Cumulative Effects

The cumulative effects for the hybrid power alternative would not be expected to vary from those described for the proposed project. The contribution of any alternative to cumulative effects to socioeconomic resources would be small compared with the effects from other ongoing and foreseeable management activities.

4.15 Environmental Justice

This section discusses the direct, indirect, and cumulative effects of the proposed project and no action alternatives on environmental justice. The resource analysis area is the project area.

4.15.1 No Action

Under the no action alternative, the coordinated plan of development described under the proposed project would not be approved. This would not have additional or disproportionate effects on minority populations including Native American, minority, or low-income populations. Demand for CBNG locally and nationally, however, could increase the potential for new proposals for exploration and development of the project area. However, because there are currently no populations residing in the small areas of private land that occur within the project area, there would be no effects to minority or low-income populations from other potential mineral resource development.

Other mineral resource development in the project area includes a portion of the proposed Antelope In-Situ Uranium Mining project. There would be no incremental, additive impact to minority or low-income populations from this project or any other foreseeable project within the Pappy Draw project area, because there is no population currently residing within the project area, which consists primarily of federal lands managed by the BLM.

4.15.2 Proposed Project

Direct & Indirect Effects

The project would have no additional or disproportionate effects on minority populations including Native American, minority, or low-income populations. The project area is relatively distant from population centers, so no population centers would be directly, indirectly, or cumulatively affected by physical or socioeconomic effects from the project.

Cumulative Effects

The project would have no additional or disproportionate cumulative effects on minority populations, including Native American, minority, or low-income populations. The project area is relatively distant from population centers, so no population centers would be cumulatively affected by physical or socioeconomic effects from the proposed project or the alternatives.

4.15.3 Buried Power Alternative

Direct & Indirect Effects

The effects to Native American tribes, minority, or low-income groups under the buried power alternative would not be expected to vary from those described for the proposed project.

Cumulative Effects

The buried power alternative would have no additional or disproportionate cumulative effects on minority populations, including Native American, minority, or low-income populations. The project area is relatively distant from population centers, so no population centers would be cumulatively affected by physical or socioeconomic effects from the proposed project or the alternatives.

4.15.4 Hybrid Power Alternative

Direct & Indirect Effects

The effects to Native American tribes, minority, or low-income groups under the hybrid power alternative would not be expected to vary from those described for the proposed project.

Cumulative Effects

The hybrid power alternative would have no additional or disproportionate cumulative effects on minority populations, including Native American, minority, or low-income populations. The project area is relatively distant from population centers, so no population centers would be cumulatively affected by physical or socioeconomic effects from the proposed project or the alternatives.

4.16 Noise

This section discusses the direct, indirect, and cumulative effects of the proposed project and no action alternatives on noise. The resource analysis area for noise is the project area and a surrounding 2-mile buffer, which includes a portion of the CDNST as a potential noise receptor.

4.16.1 No Action

Under the no action alternative, the lessee would be denied their legal rights to explore and develop the federal oil and gas leases on valid leases that have been obtained by the lessee in the three units, and the coordinated plan of development described under the proposed project would not be approved. No noise effects from the proposed project would occur if the proposed wells are not drilled.

The no action alternative would not contribute to cumulative noise effects from past, ongoing, or reasonably foreseeable activities or events in the cumulative effects analysis area.

4.16.2 Proposed Project

Direct & Indirect Effects

Noise associated with construction and production operations can create a disturbance that affects human safety (at extreme levels) or comfort and can modify animal behavior. Identifying the activities that may exceed the maximum standards is not a simple issue. Perception of sound varies with intensity and pitch of the source, air density, humidity, wind direction, screening or focusing by topography or vegetation, and distance from the observer. Noise from generators and compressors would be regulated and limited to 49 decibels, which is characteristic of noise levels in rural areas during the day (BLM 2003a). Construction-related effects would be relatively short in duration, lasting as long as construction was underway at well sites, access roads, pipelines, and other ancillary facilities such as compressor sites. Noise would be created over the operational life of the project at the individual well sites and at compressor stations. Design features discussed in Chapter 2 would serve to minimize new construction and operational effects of noise.

Temporary generators would be used to power pumps and compressors during initial testing, and to provide power for the first 6 to 12 months of the project if the exploratory wells prove to be feasible for production. Noise from generators would be regulated and limited to 49 decibels, which is characteristic of noise levels in rural areas during the day (BLM 2003a).

There are no residences in or near the project area; therefore, noise from construction and development operations would not affect residential areas. The nearest receptor would be the CDNST, which is located more than 2 miles from the nearest temporary generator and more than 5 miles from the proposed Pappy Draw compressor station. Overall, noise produced by construction and support equipment during periods of peak activity would be moderate because of the dispersed and short-term nature of these activities.

Cumulative Effects

The cumulative effects analysis area for noise includes the project area and a 2-mile buffer. Cumulative noise effects would be limited to the proposed project, the relatively few other active oil and gas facilities in the project area, and existing grazing and recreation. Cumulative noise effects would be similar to the effects described for the proposed project. Traffic would increase on existing roads in the area, adding to existing traffic noise. The additional traffic noise would be minimal because of the current and anticipated low volume and dispersed nature of traffic in the project area. However, the cumulative additional noise from all activities would combine to create an environment with a slight increase in sound disturbances.

4.16.3 Buried Power Alternative

Direct & Indirect Effects

Under the buried power alternative, impacts to noise would be the same from construction and operation project activities as the proposed project.

Cumulative Effects

The cumulative effects for the buried power alternative would not be expected to vary from those described for the proposed project. The contribution of any alternative to cumulative effects to noise would be short-term and small compared with the effects from other ongoing and foreseeable management activities.

4.16.4 Hybrid Power Alternative

Direct & Indirect Effects

Under the hybrid power alternative impacts to noise would be the same from construction and operation project activities as the proposed project.

Cumulative Effects

The cumulative effects for the hybrid power alternative would not be expected to vary from those described for the proposed project. The contribution of any alternative to cumulative effects to noise would be short-term and small compared with the effects from other ongoing and foreseeable management activities.

4.17 Health and Safety

This section discusses the direct, indirect, and cumulative effects of the proposed project and no action alternatives on health and safety. The resource analysis area for health and safety is the project area.

4.17.1 No Action

Under the no action alternative, the lessee would be denied their legal rights to explore and develop the federal oil and gas leases on valid leases that have been obtained by the lessee in the three units, and the coordinated plan of development described under the proposed project would not be approved. No additional effects on public health or safety would occur if the proposed wells are not drilled. Demand for CBNG locally and nationally, however, would increase the potential for new proposals for exploration and development of the project area. Future mineral exploration and development in the project area would increase the likelihood of effects to health and safety in the project area.

For the no action alternative, the plan of development for the Pappy Draw Project would not be approved, and would not contribute to cumulative effects to health and safety from past, ongoing, or reasonably foreseeable activities or events in the project area.

4.17.2 Proposed Project

Direct & Indirect Effects

Health and safety effects would include a relatively low risk to project workers from industrial accidents, firearms, and natural disasters. There would be a slight increase in risk of traffic accidents and range fires for the public during drilling and field development and a negligible increase during field operations.

Occupational Hazards

The statistical probability of injuries is low during the drilling and field development phase of the project, when a peak of 40 workers may be employed. The annual statistical probability of injuries is minimal during field operation because only 10 workers would be employed.

The BLM, OSHA, U.S. Department of Transportation (USDOT), WOGCC, and WDEQ each regulate certain safety aspects of CBNG development. Adherence to relevant safety regulations by EnCana and enforcement by the agencies would reduce the probability of accidents. Additionally, because of the remote nature of the project area and the relatively low use of these lands by others (primarily grazing permittees and hunters), occupational hazards associated with the project would mainly be limited to employees and contractors rather than the public.

Pipeline Hazards

The risk of pipeline failure would increase with increasing length of the gathering system and market access pipeline. The relatively small amount of new pipeline associated with the project, coupled with the low probability of failure and the remote nature of the project area, would create minimal risk to public health and safety. Pipeline markers posted on the ROWs for the pipelines reduce the likelihood that pipeline ruptures would be caused by excavation equipment, especially near road crossings or areas that would be disturbed by road maintenance.

Other Risks and Hazards

Risks to public health and safety are not expected to increase under the proposed project. Effects to highway safety are discussed in the Transportation section. Effects associated with sanitation or the materials used in CBNG development would be prevented or reduced by the mitigation measures described in Chapter 2.

The potential for firearms-related accidents would occur primarily during hunting season. If drilling and field development occur during hunting season, the amount of activity in the project area would likely encourage hunters to seek more isolated areas, reducing the potential for accidents. The relatively few personnel present during production operations would create minimal risk of firearms-related accidents.

The risk of fire in the project area could increase under the proposed project, but would remain low. Fire is a potential effect associated with construction, industrial development, and the presence of fuels, storage tanks, CBNG pipelines, and gas production equipment. This small risk would be reduced further because facilities would be situated on pads and in locations that are graded and cleared of vegetation. In the event of a fire, property damage most likely would be limited to construction- or production-related equipment and rangeland resources. Fire suppression equipment, a no smoking policy, shutdown devices, and other safety measures typically incorporated into gas drilling and production also would minimize the risk of fire. Risk of wildfire would be heightened where construction places welding and other equipment near native vegetation. However, the risk to the public would be minimal because of limited public use and presence in the project area. There would be a small increase in risk to area fire suppression personnel associated with the proposed project.

Cumulative Effects

The cumulative effects analysis area for health and safety includes Fremont and Sweetwater Counties. Cumulative effects to health and safety would be limited to effects associated with the proposed project, relatively limited existing active oil and gas development, and existing grazing and recreation. Cumulative effects to health and safety are anticipated to be similar to the effects described for the proposed project. Occasional traffic and activity associated with oil and gas exploration would slightly increase the risks to workers and the public.

4.17.3 Buried Power Alternative

Direct and Indirect Effects

Under the buried power alternative, the effects on health and safety from project activities would not be expected to vary from the effects described for the proposed project.

Cumulative Effects

The cumulative effects for the buried power alternative would not be expected to vary from those described for the proposed project. The contribution of any alternative to cumulative effects to public health and safety would be short-term and small compared with the effects from other ongoing and foreseeable management activities.

4.17.4 Hybrid Power Alternative

Direct and Indirect Effects

Under the hybrid power alternative, the effects on health and safety from project activities would not be expected to vary from the effects described for the proposed project.

Cumulative Effects

The cumulative effects for the hybrid power alternative would not be expected to vary from those described for the proposed project. The contribution of any alternative to cumulative effects to public health and safety would be short-term and small compared with the effects from other ongoing and foreseeable management activities.