
4.0 ENVIRONMENTAL IMPACTS AND MITIGATION

The potential environmental consequences of construction, drilling, completing, operation, and maintenance associated with the Proposed Action (federal land developments--nine well locations and associated developments, an interconnect pipeline and a compressor station constructed on private land) and No Action (two roads to access private development but no further development on federal land) Alternatives are discussed for each potentially affected resource. Implicit in the No Action Alternative is that if well development on federal lands is denied, the interconnect pipeline and the compressor station would not be needed (i.e., any production from wells on private lands would be transported from the field via temporary surface gas gathering lines). An environmental impact is defined as a change in the quality or quantity of a given resource due to a modification in the existing environment resulting from project-related activities. Impacts may be beneficial or adverse, may be a primary result (direct) or a secondary result (indirect) of an action, and may be permanent or long-lasting (long-term--more than 5 years) or temporary and of short duration (short-term--5 years or less). Impacts may vary in degree from a slightly discernable change to a total change in the environment.

In accordance with CEQ regulation 40 C.F.R. 1502.16, this chapter includes a discussion of the direct and indirect effects of the Proposed Action and No Action Alternatives. Possible conflicts between the Proposed Action and No Action Alternative and the objectives of the BLM RMP (BLM 1987, 1988b, 1990a), as well as state and local land use plans and policies, are identified, as are potential additional means to mitigate adverse environmental impacts that go beyond the applicant-committed and agency-required measures. Potential impacts for this project were quantified where possible. The use of adjectives such as moderate, low, and negligible have been avoided wherever possible because this EA is an analytical document, not a decision document (BLM 1996). The Decision Record for this project will be the decision document. Impact assessment assumes that applicant-committed measures are successfully implemented. If such measures are not implemented (e.g., state and private lands), additional adverse impacts may occur. The applicant-committed measures may be implemented on private land depending on landowner preference.

The Proposed Action for this project involves BLM authorization of nine wells and associated features and an interconnect pipeline on federal lands in the HDEPA. Initial and LOP disturbance associated from the Proposed Action would be approximately 162.7 acres and 39.7 acres, respectively.

Private land developments within the HDEPA have occurred and consist of nine wells and associated access roads (25.3 acres initial and 10.0 acres LOP disturbance, respectively) and the 190-acre water containment reservoir. Authorized federal land developments include two roads for which an ROW has been granted to Williams to access private land for the purpose of developing private leases. Impacts from development on private land are considered under cumulative impacts (see Section 4.11) and not as components of the Proposed Action (federal land development of nine wells and associated features and an interconnect pipeline) or No Action (no additional federal land development) Alternatives. Impacts from previously approved road reconstruction and operation on federal land are considered under the No Action Alternative.

4.1 PHYSICAL RESOURCES

4.1.1 Air Quality

Impacts to air quality would be significant if they resulted in violation of federal and/or state air quality attainment standards.

4.1.1.1 The Proposed Action

The effects of natural gas development on air quality in southwestern Wyoming have been studied extensively in recent years, including the Jonah Field II air quality study that modeled the impacts of 450 wells (BLM 1998b:Appendix G); the Continental Divide/Wamsutter II air quality study that modeled the impacts of 3,000 wells (BLM 1999a, 1999b); and the Pinedale Anticline air quality study that modeled the impacts of 700 wells (BLM 1999c). Only the Jonah Field II study found significant cumulative far-field effects to visibility; however, the Jonah

Field II study used a screening methodology to estimate far-field effects, whereas the Pinedale Anticline and the Continental Divide/Wamsutter II studies used a more refined approach (i.e., CalPuff dispersion modeling system), and these latter studies found exceedences of the 0.5 deciview threshold at nearby wilderness areas to be within an acceptable range. Furthermore, of the 3,000 wells included in the Continental Divide model, only 2,130 (71%) were approved.

There would be some temporary deterioration to air quality in the immediate vicinity of project activities (e.g., construction, drilling, completion, testing, and production) due to particulate matter and exhausts from equipment and vehicles; however, these would be localized, temporary, and quickly dispersed by the wind. Impacts would be minimized by the applicant-committed practices included in Chapter 2.0 (Section 2.1.13.10).

4.1.1.2 The No Action Alternative

Under the No Action Alternative, two roads would be used on federal land. Impacts from use on air quality would be proportionately less than for the nine-well Proposed Action.

4.1.1.3 Mitigation

No additional mitigation is recommended.

4.1.2 Topography and Physiography

Impacts to topography and physiography may be significant if they altered the natural environment in such a way that the beauty of natural vistas would be permanently impaired or if drainages would be permanently altered with resultant adverse impacts on natural water courses.

4.1.2.1 The Proposed Action

Impacts to topography and physiography from the Proposed Action (nine wells and associated facilities on public lands and an interconnect pipeline on a mixture of public and private lands) would occur from the alteration of existing landscape features and potentially increased erosion as a result of well location, facilities, and interconnect pipeline construction. However, Williams would minimize disturbance in sensitive areas (e.g., steep slopes, drainages) and would reclaim all disturbed lands to approximate original conditions upon completion of construction and/or production activities (Sections 2.1.12 and 2.1.13.11). Approximately 162.7 acres of federal land would be disturbed initially, and about 39.7 acres of federal land would be disturbed for the LOP.

4.1.2.2 The No Action Alternative

Under the No Action Alternative, no additional impacts to topography and physiography would occur. Topography and physiography would also continue to be modified by natural processes and may be otherwise impacted by other activities.

4.1.2.3 Mitigation

BLM would recommend that facilities be sited below ridge lines and screened from known vantage points.

4.1.3 Minerals/Geologic Hazards

4.1.3.1 The Proposed Action

The Proposed Action would lead to extraction and use of the CBM resource and possible temporary loss of access to gravel or other potential mineral reserves in the HDEPA and proximal to construction sites. The purpose of the project is to obtain the methane present in the Hanna coals and to put it to beneficial use, so no mitigation would be applied.

The proposed project would not contribute to increased risk of seismic events. Earthquake-induced ground shaking may result in damage to aboveground structures; however, buried structures (e.g., well casing, the pipeline) would only be affected when shaking induces ground failure. Construction would occur such that the chance of damage from these factors would be minimized, although complete protection is impossible.

The only project facility located over the now-closed Shoshone underground mine is the existing Hanna Draw Road. Underground mining using a longwall leaves an overburden rubble pile that typically fills the void in the mined-out area. Subsidence, when and if it occurs, would occur gradually (imperceptibly) over the Shoshone Mine area rather than catastrophically (BLM 1998a), so no impacts from subsidence are anticipated.

Erosion control and reclamation procedures would ensure that no excessive erosion of wind-blown deposits occurs and that the chance of landslides would not be increased.

Floodplains and flooding would not be directly impacted by construction, operation, or maintenance of the project. However, increased sediment may be transported downstream if flooding occurred during construction.

4.1.3.2 The No Action Alternative

The natural gas reserves on federal lands in the HDEPA would not be developed and thus would not be available to meet national energy demands. Development of adjacent private leases may result in the incidental drainage and loss of federal mineral. The federal government would not benefit from royalties and taxes from the project, although state and local governments would. Project-related economic activity, employment, and income would be reduced by about 36% (a total of 16 wells, rather than 25) from that described for the Proposed Action. Also, Williams's rights to develop their leases would be infringed, which would be a significant adverse impact that would violate contractual agreements between the government and the leaseholders.

The No Action Alternative is available to the BLM if T&E species or their habitat would be affected and/or environmental impacts of the Proposed Action are unacceptable.

Under the No Action Alternative, impacts from flooding would be similar to those described for the Proposed Action but reduced due to less surface use. Floodplains would not be impacted.

Under the No Action Alternative, impacts from geologic hazards would be similar to those described for the Proposed Action--the Hanna Draw Road crosses the Shoshone No. 1 underground mine.

4.1.3.3 Mitigation

No additional mitigation is recommended.

4.1.4 Paleontology

Impacts to paleontological resources may be significant if important fossils would be directly lost or destroyed during construction without proper mitigation or indirectly lost or destroyed due to private collection or vandalism.

4.1.4.1 The Proposed Action

Potential impacts to fossils under the Proposed Action may result from the loss/destruction of fossils during construction and/or from private collection or vandalism due to increased human presence in the area. Impacts would be minimized because Williams has committed to the recovery or avoidance of any paleontological resources uncovered during ground-disturbing activities, if such recovery or avoidance were deemed necessary by the BLM (Section 2.1.13.4). Dr. Jason Lillegraven, Professor of Geology at the University of Wyoming, concurs with this evaluation (Winterfeld 2001).

4.1.4.2 The No Action Alternative

Under the No Action Alternative, paleontological resources would not be affected.

4.1.4.3 Mitigation

No additional mitigation is recommended.

4.1.5 Soils

Impacts to soils may be significant if a reduction in soil productivity and/or increased erosion would prevent successful reclamation and revegetation and/or excessive soil loss occurs.

4.1.5.1 The Proposed Action

A total of approximately 162.7 acres of federal land would be disturbed in the short-term, and 39.7 acres of federal land would be disturbed for the LOP (see Table 2.1). Direct impacts to soils would include soil exposure due to vegetation removal, mixing of soil horizons, loss of topsoil productivity, soil compaction, and increased susceptibility to wind and water erosion. These impacts may, in turn, result in increased runoff and erosion and possible increased sedimentation in the Medicine Bow River. The potential for increased surface runoff and erosion would be greatest in the short term immediately after surface disturbance and would decline over time due to concurrent reclamation, natural stabilization through particle aggregation, soil structure development, and armoring. Short-term surface runoff control would be accomplished through reclamation and revegetation as described in Surface Use Plans or Plans of Development prepared for each APD and/or ROW application. Reclamation and revegetation procedures would be designed to reduce the susceptibility of disturbed areas to soil erosion in both the short term and for the LOP. The potential for soil contamination due to accidental spills would be limited by appropriate project implementation procedures and the remedial measures applied as specified in SPCC Plans (Section 2.1.9). Since produced water would be discharged into the reservoir rather than into existing drainages and because no irrigation is occurring in the project

area vicinity, the project would not affect sodium adsorption ratios in project area soils. With the implementation of applicant-committed practices designed to protect soils (e.g., minimizing disturbance, avoiding steep slopes, using best management practices for reclamation and revegetation) (Sections 2.1.12 and 2.1.13.12), impacts to soils would be minimized.

4.1.5.2 The No Action Alternative

Under the No Action Alternative, no additional soils impacts would occur. Soils would also continue to be modified by natural processes and may be otherwise impacted by other existing land uses (e.g., livestock grazing, recreation).

4.1.5.3 Mitigation

BLM may deny activities in areas with high erosion potential and/or rugged topography. Any disturbance in the aforementioned areas would require site-specific mitigations. Detailed plans of proposed surface-disturbing actions may be required for developments proposed on slopes and/or in areas where soil or site stability/erodability factors are deemed to be limited by the BLM. This mitigation would reduce the amount of soil lost due to accelerated erosion from disturbance in areas with high erosion potential and/or rugged topography.

4.1.6 Water Resources

Impacts to water could be significant:

- if water quality declined such that existing water quality standards would be violated;
 - if existing beneficial uses are adversely affected;
 - if WDEQ surface water quality class would be downgraded;
 - if WDEQ-imposed water quality limitations are exceeded;
 - if violations of the *Clean Water Act* occur; or
 - if quantities of water would be depleted such that the water rights of existing users would be violated.
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4.1.6.1 The Proposed Action

Potential impacts to surface water resulting from the Proposed Action include increased turbidity, salinity, and sedimentation due to increased runoff and erosion from disturbed areas or accidental spills of petroleum products or other pollutants. Produced water and pipeline test water would be discharged to the containment reservoir, and so produced/discharge water would not affect surface water quality. Wind and water erosion rates would increase above current rates until disturbed areas are successfully reclaimed. The potential for stream sedimentation would be minimized through the implementation of applicant-committed practices and mitigation measures, including proper facility siting to avoid riparian areas and floodplains, use of best management practices, and proper reclamation and revegetation (Sections 2.1.12 and 2.1.13.11). With successful reclamation, only a very minor amount, if any, project-related sediments would reach Hanna Draw or the Medicine Bow River. With the discharge of produced/hydrostatic test water either into the containment reservoir or into an ephemeral stream as described in Section 2.1.8.4, the Proposed Action would not result in violations of the *Clean Water Act*.

No springs or seeps occur in the proposed exploration area. Springs and seeps in the pipeline corridor may be adversely affected (e.g., reduced flows, possible contamination) where construction occurs in source areas. However, proper erosion control and hazardous material containment would reduce the potential for impacts to springs and seeps.

Flood-prone areas would be avoided, where practical, so impacts associated with flooding are not anticipated.

Potential impacts to ground water and current ground water wells from the Proposed Action include water consumption during drilling, completion, testing, and production operations; contamination of shallow aquifers from drilling, fracturing fluids, and/or produced water; loss of ground water in existing wells; and cross-aquifer mixing through the well bore. Minimization of these potential impacts would be accomplished by implementing project-wide environmental practices that include well bore cementing, implementation of SPCC Plans, and compensation for potential loss of ground water wells (Sections 2.1.1.2 and 2.1.13.13).

All produced water would be held in reserve pits or the water containment reservoir; no other surface discharge is proposed. The reservoir is designed to hold 500 acre-ft of water while maintaining 5 ft of freeboard. Calculations in the Water Management Plan (Appendix B) suggest that the volume of produced water would not exceed the capacity of the reservoir. However, if at any time it appears that the reservoir capacity would be exceeded, Williams would either shut in wells or reduce the rate of water discharge in one or more wells. Either of these actions would slightly reduce the amount of information Williams may obtain concerning the productivity of a given well but would not adversely affect their ability to assess the field for possible CBM production. Water quality data show that produced water will be suitable for livestock and wildlife watering and for aquatic life (Tables 3.5 and 3.6), and water in the reservoir will be required to meet the water quality standards set by WDEQ in Williams's NPDES permit.

After the 18-month exploration phase of the project, water in the reservoir would be allowed to evaporate. The private landowner may wish to maintain a reservoir for stock watering, in which case Williams would lower the dam so that the reservoir's size is more appropriate for use as a stock pond. If the landowner does not wish to use the reservoir, the dam would be removed after all the water has evaporated, and the area would be reclaimed. Assuming an annual evaporation rate of 122.5 acre-ft (183.8 acre-ft over the 18-month LOP), an annual precipitation input to the reservoir of 35.88 acre-ft (53.82 acre-ft over the 18-month LOP), and annual run-off into the reservoir of 13.20 acre-ft and assuming the reservoir is full (500 acre-ft) at the end of 18 months of exploration, it would take 6 years to completely evaporate the water in the reservoir. Complete evaporation would likely occur more quickly because, as water levels decline, the water would heat up more quickly and evaporation rates would increase. Water quality would degrade, but each year about 30% of the water that evaporates would be replenished with fresh precipitation. Salt and other major constituent concentrations would increase in a similar manner as local stock ponds, which typically fill and dry annually.

Surface water would not be adversely impacted by interconnect pipeline construction because of the various applicant-committed practices described in Chapter 2.0. The small amount of water used for pipeline testing and dust control would not affect downstream users.

Reservoir stage will be monitored to ensure that the reservoir permitted capacity is not exceeded. Water quality monitoring would be conducted in accordance with the NPDES permit.

4.1.6.2 The No Action Alternative

Under the No Action Alternative, impacts to surface water would occur due to use of two roads that cross federal land. Impacts to water resources would include increased turbidity, salinity, and sedimentation due to increased runoff and erosion from disturbed areas or accidental spills of petroleum products or other pollutants. Impacts would be lower than for the Proposed Action because no additional surface disturbance and less surface use would occur. Ground water would not be impacted under the No Action Alternative.

4.1.6.3 Mitigation

BLM may deny activities in areas with high erosion potential and/or rugged topography. Any disturbance in the aforementioned areas would require site-specific mitigations. Detailed plans of proposed surface-disturbing actions may be required for developments proposed on slopes and/or in areas where soil or site stability/erodability factors are deemed to be limited by the BLM. This mitigation would reduce the amount of sediment that would enter surface waters due to accelerated erosion from disturbed areas with high erosion potential and/or rugged topography.

To protect public land, no discharge from the produced water reservoir would be allowed to cross public land surface without BLM's prior approval.

Ground water monitoring, including the installation of ground water monitoring wells, well logging, and pump testing, may be required by BLM to monitor project impacts on ground water. A monitoring plan would be developed and implemented by Williams, subject to BLM's approval.

All mitigations required by WDEQ/WQD as conditions on the water containment reservoir permit would be required by the BLM.

4.1.7 Noise and Odor

Impacts from noise may be significant if long-term project activities exceed the federal 55-dBA standard for noise at residences. This standard would also be applied at other noise-sensitive locations on federal land such as greater sage-grouse leks during breeding season, raptor nests during breeding and nesting seasons, and big game crucial winter ranges during critical winter periods. Impacts from odor may be significant if they preclude existing uses of the HDEPA.

4.1.7.1 The Proposed Action

Project-generated noise under the Proposed Action would exceed 55 dBA during construction, drilling, and completing operations; however, such noise levels would be short-term and mitigated (Section 2.1.13.14) and would not occur at noise-sensitive locations during greater sage-grouse or raptor breeding/nesting seasons or during big game critical winter periods. Compressor engines would generate about 92 dBA at 10 ft (55 dBA at 600-700 ft), and the air intakes 119 dBA at 3 ft (55 dBA at 3,000 ft). These noise levels are for unhoused and unmuffled compressors and would be reduced through required controls by housing the compressors and by installation of silencers on exhaust stacks. If the pilot project is successful, the compressor station would be built, and compressor noise would occur throughout the LOP.

Project-wide environmental practices would avoid construction, drilling, and completion activities if they would adversely affect wildlife (Section 2.1.13.15). Project-generated odors would generally be related to the operation of internal combustion engines and other project facility emissions, especially during construction, drilling, and flaring activities. Potential impacts due to odors would be short-term, and any odors would be quickly dissipated by the wind; therefore, existing uses of the HDEPA would not be precluded.

4.1.7.2 The No Action Alternative

Under the No Action Alternative, noise or odor would occur within the HDEPA due to road use on federal land. Noise and odor levels would likely change as described for the Proposed Action, but impacts would be reduced.

4.1.7.3 Mitigation

The BLM may require that noise levels be limited to no more than 10 dBA above background levels at sage grouse leks and other sensitive resource areas. To comply with these noise limits, BLM may require compressor engines to be enclosed in a building and located at least 600 ft away from sensitive receptors or sensitive resource areas (BLM 1999d).

4.2 BIOLOGICAL RESOURCES

4.2.1 Vegetation

Impacts to plant communities may be significant if there was a long-term reduction in vegetation productivity or a permanent change in species composition.

4.2.1.1 Plant Communities

The Proposed Action. Vegetation on 162.7 acres of the federal land would be disturbed initially; 39.7 acres of federal land would be disturbed for the LOP. The sagebrush steppe communities to be disturbed are common and widespread, and no rare communities or communities of concern are known to occur in the HDEPA (WNDD 2001). Reclamation would provide for revegetation with native plant species common to the area (Sections 2.1.12 and 2.1.13.6). Disturbed areas would produce less forage for a few years until revegetation is successful, after which grasses and possibly forbs would become more abundant and possibly more productive than prior to disturbance. Shrubs may take 20 years or more to reach predisturbance abundance and productivity. A long-term reduction in vegetation productivity would occur in those areas that remain disturbed for the LOP, but no permanent change in species composition would occur.

Reclamation potential in grassland and shrub-dominated areas would be good to excellent; in more barren areas (e.g., rocky knobs, clay slopes, and wind-blown deposits), reclamation would be limited by shallow soils, droughtiness, salinity, alkalinity, steep slopes, noncohesive soils, weather (high winds, drought), short growing seasons, and livestock and wildlife use.

Areas to be avoided, where practical, include:

- areas with high erosion potential (e.g., rugged topography, steep slopes [$>25\%$], windblown deposits, floodplains);
- areas with saturated soils; and
- wetland/riparian areas.

4.2.1.2 The No Action Alternative

Under the No Action Alternative, use of two roads on federal land would not affect vegetation.

4.2.1.3 Mitigation

The BLM may require minimal surface disturbance (e.g., limited ROW surface grading) during gas and water line and interconnect pipeline construction. Where new roads are constructed instead of upgrading existing roads/two-tracks and these new roads make existing roads/two-tracks redundant, the BLM may require reclamation of the existing redundant roads/two-tracks. Both of these mitigations would slightly reduce both initial and LOP surface disturbance.

4.2.2 Wetlands and Riparian Areas

Impacts to wetlands/riparian areas would be significant if a violation of Section 404 of the *Clean Water Act* or Executive Orders 11988 or 11990 occurred and/or if there is degradation of riparian condition or function.

4.2.2.1 The Proposed Action

Any disturbance to wetlands/riparian areas would be minimal and would result primarily from linear facility crossings of these areas. Disturbances to wetlands/riparian areas would be mitigated in accordance with the applicant-committed practices specified in Section 2.1.13.7. The interconnect pipeline alignment would be situated within the proposed corridor so as to avoid/minimize disturbance to wetlands/riparian areas. No net loss of wetlands would occur due to project-related activities. Any disturbance to wetlands/riparian areas or other waters of the U.S. would be appropriately permitted by the COE.

4.2.2.2 The No Action Alternative

Wetlands and riparian areas would not be affected under the No Action Alternative.

4.2.2.3 Mitigation

No additional mitigation is recommended.

4.2.3 Nonnative Invasive Species

Impacts from nonnative invasive species may be significant if new species of nonnative invasive species became established and/or if noxious weed abundance increased such that it adversely affected current land uses.

4.2.3.1 The Proposed Action

Habitat suitable for nonnative invasive species and other undesirable plant species would be created as a result of removal of existing vegetation, and nonnative invasive species may become established and/or more abundant in these areas; however, Williams would take measures to control undesirable plant invasions (Section 2.1.13.5), pursuant to BLM and Carbon County Weed and Pest Supervisor guidance. Nonnative invasive species also may be introduced to the project area by equipment bearing weed seeds--all equipment would be washed using a high-powered washer prior to being transported to the HDEPA and vicinity.

4.2.3.2 The No Action Alternative

Under the No Action Alternative, potential for the introduction of nonnative invasive species on federal land would be restricted to those areas along the two existing road ROWs.

4.2.3.3 Mitigation

No additional mitigation is recommended.

4.2.4 Wildlife and Fisheries

Impacts to wildlife resources may be considered significant:

- if they prevent realization of specified population objectives;
- if they result in the disruption of raptor breeding activities and subsequent reproductive failure;
- if they result in the continuous disruption of greater sage-grouse breeding activities; and/or
- if they preclude the use of the HDEPA by wildlife species that currently inhabit the area.

4.2.4.1 The Proposed Action

Approximately 31.4 acres of year-long and 29.8 acres of crucial winter pronghorn range would be disturbed on federal land in the exploration area. An estimated 54.4 acres of year-long and 45.7 acres of winter year-long pronghorn range on federal land would be disturbed along the pipeline corridor. No winter year-long range and 14.9 acres of crucial pronghorn range would be disturbed for the LOP. An estimated 71.3 acres of year-long/winter and 6.0 acres of crucial winter mule deer range on federal land would be disturbed initially. Approximately 13.1 acres of winter/year-long and 3.0 acres of crucial winter mule deer range would be disturbed for the LOP. Reclaimed areas would produce less forage for a few years until revegetation is successful, after which time grasses and forbs may become more abundant and possibly more productive than predisturbance vegetation. Shrubs, however, may take 20 years or longer to reach predisturbance abundances and productivity.

Noise, especially during construction, drilling, and venting, would reduce big game use of habitat close to such activities. Pronghorn and mule deer would likely habituate to human presence during other phases of the Proposed Action.

Although some level of habitat displacement was noted in pronghorn populations adjacent to oil and gas development in Wyoming, New Mexico, and Texas (Gusey 1986; Guenzel 1987;

Easterly et al. 1991), Easterly et al. (1991) found that pronghorn returned to these habitats once the source of the disturbance left the area. Segerstrom (1982) and Deblinger (1988) determined that a large proportion of the pronghorn populations inhabiting surface mine sites in Wyoming were relatively unaffected by mining activities and habituated to the presence of personnel and vehicles.

Mule deer may also habituate to increased human activity in the area. Mule deer frequented areas in and near oil fields in central Wyoming and appeared less sensitive to human-caused disturbances than pronghorn (Easterly et al. 1991). Irby et al. (1988) noted that low-level oil and gas development in western Montana had little effect on wintering mule deer; high-intensity exploration and production activity, however, may impact populations by making wintering areas unsuitable for mule deer. Mule deer continued to occupy areas immediately adjacent to an operating coal mine in Wyoming (Reed 1981). Mule deer also apparently habituate to the auditory and visual stimuli associated with access roads and have been observed using areas adjacent to these roads (Reed 1981; Easterly et al. 1991).

Increased mortality from vehicle/animal collisions is a potential direct impact that may occur due to increased traffic on and adjacent to the HDEPA for the LOP. Increased access to big game range may also increase legal and illegal harvest (primarily of pronghorn) by providing additional opportunities for access; however, poaching also may be reduced because of the increased human activity in the area. Williams would implement policies to control poaching/harassment of wildlife by their employees and to minimize vehicle/animal collisions (see Sections 2.1.13.15 and 2.1.13.20).

If the exploration project is successful, a compressor station would be constructed on private land and would create long-term noise within the exploration area. Some big game displacement, at least initially, from the compressor station is expected, but big game would likely habituate to the noise as for the other types of human disturbances described above.

During scoping, the USFWS and BLM raised the concern that, as produced water evaporates, compounds in the water, especially selenium, would become increasingly concentrated and would

cause harm to wildlife and livestock using the reservoir. The reservoir is constructed to hold 500 acre-ft of water and would be gradually filled with produced water over the course of the 18 month exploration project. The exploration project would result in the discharge of slightly more (593.0 acre-ft) than one reservoir volume. Evaporation is estimated to be approximately 122.5 acre-ft per year, so over an 18-month life of the exploration project, an estimated 183.8 acre-ft would evaporate, or about 31.0% of the 593.0 acre-ft to be discharged. Table 4.1 shows that produced water quality, even when concentrated by about 33%, would still meet WDEQ standards for livestock and wildlife watering and aquatic life.

The main source of potentially harmful compounds entering the reservoir would be produced water. Little sediment is expected to be contributed from the surrounding lands because the reservoir is located on a topographic high between two drainages, and thus it does not receive sediment contributions typical of terminal lakes. Furthermore, ditches and dikes would be used to divert surface runoff around the reservoir.

Selenium is a naturally occurring element that is typically present in soil at a concentration of approximately 200 µg/kg. The shallowest selenium-bearing Cretaceous sediments occur over 5,000 ft below the ground surface and thus are not a potential source for elevated selenium in the reservoir. Because the produced water contains <5 µg/l selenium, it is not likely that water would contribute to any notable increase in selenium in the reservoir's sediments during the 18 months of reservoir operation. However, the limited period of operation and the low concentration of selenium in the produced water will limit the extent to which evaporative concentration of selenium can occur.

As water evaporates from the reservoir after the 18-month exploration phase of the project, water quality would degrade, but each year about 30% of the water that evaporates would be replenished with fresh precipitation. Salt and other major constituent concentrations would increase; however, since selenium levels in produced water are below detection, the amount of increase in selenium concentration, if any, cannot be predicted. Impacts on water quality due to evaporation would be similar to those of local stock ponds, which typically fill and dry annually.

Table 4.1 Concentration of Selected Compounds/Elements in the Reservoir After 18 Months of Evaporation.¹

Parameter	Produced Water Quality			
	Composite (6 wells) (Analyzed)	Concentrated 33% ² (Computed)	Shown in NPDES Application (Analyzed)	Concentrated 33% ² (Computed)
MAJOR IONS				
Bicarbonate as HCO ₃ (mg/l)	658		956	
Carbonate as CO ₃ (mg/l)	<1		na	
Chloride (mg/l)	16	21	484	644
Fluoride (mg/l)	3.0		2.6	
Sulfate (mg/l)	290		14.1	
Calcium (mg/l)	6		na	
Magnesium (mg/l)	3		.32	
Potassium (mg/l)	3		na	
Sodium (mg/l)	380		22.3	
METALS³				
Aluminum (µg/l)	<50	<66	<50	<66
Antimony, total (µg/l)	<5		<5	
Arsenic, total (µg/l)	0.3	0.4	1.1	1.5
Barium, total (µg/l)	200		1191	
Beryllium, total (µg/l)	<0.03		<1	
Boron, dissolved (µg/l)	<100		na	
Cadmium (µg/l)	<0.1	<1	<0.1	<0.1
Chromium (µg/l)	4	5	<1	<1
Copper (µg/l)	3	4	7	9
Iron, dissolved (µg/l)	40	53	5595	7,441
Lead (µg/l)	<2	<3.0	na	na
Manganese, dissolved (µg/l)	75	99	115	153
Manganese, total (µg/l)	80		145	

Table 4.1 (Continued)

Parameter	Produced Water Quality			
	Composite (6 wells) (Analyzed)	Concentrated 33% ² (Computed)	Shown in NPDES Application (Analyzed)	Concentrated 33% ² (Computed)
Mercury (µg/l)	<0.06	<0.1	<0.1	<0.1
Nickle (µg/l)	<10	<13	<10	<13
Selenium (µg/l)	<5	<7	<5	<7
Silver (µg/l)	<3	<4	<3	<4
Thallium, total (µg/l)	<10		<10	
Zinc (µg/l)	20	27	<10	<13
NON-METALS				
Alkalinity, Total as CaCO ₃ (mg/l)	540		1075	
Conductivity @ 25°C (µmhos/cm)	1650		3185	
Cyanide, Total automated (µg/l)	<5.00	<7	9.5	12.6
Hardness as CaCO ₃ (mg/l)	23		75	
pH (s.u.)	8.67		8.5	
Sodium adsorption ratio	34.7		20.7	
Total Dissolved Solids (mg/l)	1020		1790	
Total Petroleum Hydrocarbons (mg/l)	<1.0		na	
Radium 226 (pCi/l)	na		1.4	

¹ na = constituent not reported; µg = micrograms; mg = milligrams; pCi = picocuries, l = liters; µmhos = micromhos; s.u.= standard units.

² Concentrated amounts were calculated for only those parameters for which WDEQ standards exist.

³ Soluble metals unless otherwise noted.

Raptors would be protected by seasonal restrictions near occupied nests during breeding and nesting seasons (Section 2.1.13.15). Because only 39.7 acres of federal land would be disturbed for the LOP, any reductions in raptor prey species would be minimal and unlikely to affect raptor populations.

Greater sage-grouse leks would be protected by restricting construction within 2.0 mi of any lek during the breeding and nesting season. No surface occupancy would be allowed on federal land within 0.25 mi of an active lek. Nesting areas within 2.0 mi of a lek would be surveyed during the nesting season prior to disturbance, and any nests that may be found in these areas would be avoided until nesting is complete (Section 2.1.13.15).

If the pilot project is successful, the compressor would create long-term noise within the exploration area, which may adversely affect strutting greater sage-grouse. BLM may require compressor engines to be enclosed in a building and located at least 600 ft from leks (BLM 1999d). No other noise emanation sources would occur on federal land within 0.25 mi of greater sage-grouse leks.

Mourning doves would not be affected by the Proposed Action because of the low level of disturbance to their habitat and their inherent mobility and the continued availability of suitable habitats on undisturbed lands.

Other mammals, birds, reptiles, and amphibians would be affected by the proposed project. Some habitat would be lost due to surface disturbance and human activity, and some small, relatively immobile animals would be killed, especially in construction areas during construction and along roads due to increased traffic. Project impacts to small mammals would likely be masked by natural variations in populations due to weather, disease, and other natural factors. Similar habitats to those affected by the project are common on and in the vicinity of the HDEPA, and many wildlife species have a high reproductive potential that allows them to rebound from the impacts of any direct mortality.

Initial construction and drilling activities may degrade water quality due to increased erosion and runoff and thus adversely affect fish. This potential impact would be mitigated with proper erosion control throughout the LOP.

4.2.4.2 The No Action Alternative

Under the No Action Alternative, project effects on wildlife would occur due to increased mortality from vehicle animal collisions along the two roads authorized for this project. Wildlife would continued to be disturbed due to traffic on the roads. No additional impacts to wildlife would occur.

4.2.4.3 Mitigation

No additional mitigation is recommended.

4.2.5 Threatened, Endangered, Proposed, Candidate, and Sensitive Species

Any action that would adversely affect or jeopardize TEP&C species or their critical habitat and/or any recovery program for such species would be a significant impact without appropriate consultation with the USFWS and adherence to USFWS BO terms, conditions, and reasonable and prudent measures. Any action that would cause a BLM-sensitive species (Table 3.5) to become federally listed would be a significant impact.

A BA (Appendix D) was prepared for this proposed project and provided to the USFWS with this EA. The following material is a summary of the potential impacts resulting from the proposed project as described in the BA.

4.2.5.1 The Proposed Action

Williams has proposed applicant-committed practices to reduce or eliminate impacts to listed species (Section 2.1.13.16). These mitigations were developed with the BLM and USFWS and are included in the BA for this project (Appendix D).

Black-footed Ferret. It is anticipated that there would be no impact to this species because no black-footed ferrets are known to occur in the HDEPA and mitigation measures for potential impacts to black-footed ferrets would be applied (Section 2.1.13.16). Note that the area south and east of the North Platte River was declared ferret-free in 1991 as part of the ferret introduction plan (WGFD and BLM 1991), so any ferrets that occur in the project area would be considered experimental/nonessential.

Mountain Plover. Since the exact locations of well pads, facilities, and the interconnect pipeline are not yet known, it is not possible to estimate the amount of potential mountain plover habitat that would be lost, although it would likely be minimal: 1) since no mountain plover were observed during surveys and 2) given the small amount of potential habitat in the HDEPA. The direct loss of mountain plover breeding and foraging habitat due to proposed project activities is likely to adversely affect individuals through habitat loss and displacement from directly affected and adjacent areas; however, with the implementation of applicant-committed measures, the proposed project is unlikely to result in a take of individuals. Furthermore, given the limited and scattered nature of ground disturbance and the reclamation of habitats to conditions suitable for plover breeding and nesting, the proposed project is unlikely to cause the long-term displacement of plovers from disturbed breeding and nesting areas.

State-sensitive Species. Project activities that may impact state-sensitive species are similar to those presented for TEP&C and other wildlife species. Most state-sensitive plant and animal species are not anticipated to be adversely impacted by the Proposed Action. Brewer's sparrow, Baird's sparrow, sage thrasher, sage sparrow, long-billed curlew, and loggerhead shrike would likely be displaced during construction; however, adequate undisturbed habitats remain available on and adjacent to the HDEPA. Swift fox, Townsend's big-eared bat, northern goshawk, and peregrine falcon are likely infrequent visitors to the area and would not be impacted. Potential impacts to ferruginous hawks would be mitigated as described for other raptors. Areas of potential Gibben's beardtongue and Nelson's milkvetch habitat may be disturbed; surveys for individuals of these species would be conducted in potential habitat during the period when these plants can be positively identified. In the event sensitive species are found, they would be

avoided through facility site relocation or impacts would be otherwise mitigated in consultation with the BLM (Section 2.1.13.16).

The species most likely to be adversely affected would be white-tailed prairie dog, greater sage-grouse, and burrowing owl. Impacts to prairie dog colonies would directly (mortality) and indirectly (habitat loss) affect white-tailed prairie dogs and would affect burrowing owls. Some individuals would likely be displaced to adjacent colonies. Impacts to greater sage-grouse are discussed in Section 4.2.4. However, since project development and operation would be performed in a manner to minimize disturbance of potential habitat for these species, potential project impacts are not anticipated to cause the listing of either species.

4.2.5.2 The No Action Alternative

Under the No Action Alternative, use of two roads on federal lands would minimally affect TEP&C species due to human activity along the roads. No other impacts to TEP&C species are anticipated.

4.2.5.3 Mitigation

The BLM may deny all project development actions within areas where TEP&C and other sensitive plant and animal species are found or are likely to occur. This mitigation would reduce the potential for inadvertent destruction of any TEP&C species or inadvertent disturbance of their habitat.

4.3 CULTURAL RESOURCES

Significant impacts to cultural resources may include: 1) the loss of NRHP qualities of cultural resources that are eligible for listing on the NRHP; 2) any surface-disturbing activities within 0.25 mi of a historic trail unless such disturbance would not be visible from the trail or would occur in an existing visual intrusion within the 0.25-mi buffer; and 3) disturbance of sites of religious or cultural significance to Native Americans.

4.3.1 The Proposed Action

Potential impacts to specific eligible or unevaluated properties are unknown at this time; however, it is possible that project construction activities may uncover cultural resource sites, and some of these sites may be NRHP eligible. In the exploration area, potential direct impacts to NRHP-eligible cultural properties would primarily result from construction-related activities; however, since these potential impacts would be mitigated on a case-by-case basis as determined during site-specific APD and ROW reviews, following procedures promulgated under the *National Historic Preservation Act* (NHPA) at 36 C.F.R. 800 and/or the NCPA and WSP, impacts would be reduced. The proposed pipeline route (once it is finalized) would be surveyed for cultural resources prior to any surface disturbance in accordance with the NHPA, and appropriate avoidance and other mitigation measures would be implemented to minimize impacts.

Some increase in indirect impacts to cultural resources, (e.g., unauthorized collection of artifacts) would occur due to increased access to the area. However, these impacts would be reduced due, in part, to the enforcement of the *Archaeological Resource Protection Act of 1979* (ARPA), and inventories and monitoring would locate most significant sites within and adjacent to disturbance areas.

Consultations with Native American groups would be conducted if religious or culturally important sites are identified within the HDEPA, and the BLM would review the potential impacts on a site-specific basis to determine what measures are necessary to prevent or mitigate significant impacts to religious or culturally important areas. Surveys to determine the presence of eligible cultural resources, mitigations required to comply with regulations and stipulations (Section 2.1.13.3), and continued consultation with Native American groups, as necessary, would assure that overall impacts to cultural resources from the Proposed Action would be reduced.

Beneficial impacts to cultural resources from the Proposed Action may include the discovery of important cultural resources during the Class III surveys of proposed development areas.

4.3.2 The No Action Alternative

Under the No Action Alternative, no additional impacts would occur to cultural resources.

4.3.3 Mitigation

No additional mitigation is recommended.

4.4 SOCIOECONOMICS

Impacts to socioeconomics may be significant if they increased demand for temporary housing or for local government facilities in excess of their availability.

4.4.1 The Proposed Action

Because many of the workers on this project would come from the local workforce, the Proposed Action would contribute to the local economy. Demand for temporary housing is anticipated to be low because of the low level of workforce required (Table 2.2) and since many workers would come from the local workforce. In addition, various taxes generated by the purchase of equipment and supplies and development activities and taxes and royalties generated by gas production would generate additional revenues to the county, state, and federal governments.

A hypothetical gas stream of 1 million cubic feet per day (mmcf) would generate \$730,000 annually, assuming a gas price of \$2.00 per thousand cubic feet (mcf) (Table 4.2). Assuming transportation costs were \$0.25/mcf, this 1-mmcf stream of gas would generate \$79,844 in federal royalties, \$38,325 in state severance taxes, and \$41,918 in county ad valorem taxes annually. Half of the \$79,844 in federal royalties would be returned to the state. In addition, property tax revenues would increase due to the increased tax base resulting from capital improvements, and sales tax revenues would increase as local workers spend most of their earnings in local communities.

Table 4.2 Estimated Annual Income and Tax Revenues Resulting from a One Million Cubic Feet Per Day (1 mmcf) Stream of Natural Gas.

Item	Value (\$)
Gross Annual Income ¹	730,000
Annual Transportation Costs ²	91,250
Gross Annual Income Less Annual Transportation Costs	638,750
Annual Federal Royalties ³	79,844
Annual State Severance Taxes ⁴	38,325
Annual County Ad Valorem Taxes ⁵	41,918

¹ Assumes 365 mmcf gas recovered and sold at \$2.00 mcf.

² Assumes average transportation cost of \$0.25/mcf.

³ Assumes 12.5% royalty on gross annual income less annual transportation costs.

⁴ Assumes 6% rate on gross annual income less annual transportation costs.

⁵ Assumes 7.5% Carbon County rate on gross annual income less annual transportation costs and federal royalties.

4.4.2 The No Action Alternative

Under the No Action Alternative, the federal royalties (half of which would be returned to the state) would not be generated, and severance taxes to the state and ad valorem taxes to the county would be reduced. Reducing the project size by 36% and eliminating construction of the interconnect pipeline would also reduce the number of employees needed to construct and operate the project.

4.4.3 Mitigation

No additional mitigation is recommended.

4.5 LAND USE

Impacts to land use may be significant if other beneficial uses are severely reduced for the long-term (e.g., recreation) or if there is a reduction in livestock use of a magnitude that requires modifications to grazing allotments or other actions that prevent realization of grazing goals.

4.5.1 The Proposed Action

For the LOP, 39.7 federal acres would be disturbed and unavailable for grazing use. An estimated 162.7 federal acres would be disturbed initially but would be reclaimed and revegetated shortly after disturbance. The 39.7 acres of long-term disturbance on federal land would result in a loss of approximately 6.6 AUMs, or 0.1% of the AUMs in the Dana Block North Allotment. (The Chase Allotment occurs only along the pipeline corridor so no LOP AUM loss would occur.) Reclamation during and after the LOP would return disturbed lands to predisturbance production for livestock grazing. Williams would coordinate project activities with ranching operations to minimize conflicts and would maintain all fences, cattle guards, etc., required for Williams's transportation network (see Section 2.1.13.19).

Hunting opportunities for pronghorn and mule deer on the HDEPA may be reduced for safety and aesthetic considerations (i.e., hunters may choose to hunt in other areas with less industrial development), although project-related roads may increase access to the area. Legal access to federal land would not be restricted or eliminated.

Existing ROWs would be respected, and ROW holders would be notified before any actions occur within such ROWs.

Upon project abandonment, land uses would revert to those that occurred prior to project initiation.

4.5.2 The No Action Alternative

Under the No Action Alternative, no land use changes would occur on federal land (two existing roads would be used) and no additional AUMs would be lost. CBM development on adjacent private lands may affect recreational opportunities in a similar manner as for the Proposed Action.

4.5.3 Mitigation

No additional mitigation is recommended.

4.6 VISUAL RESOURCES

Impacts to visual resources would be significant if development activities violate BLM VRM class management objectives.

4.6.1 The Proposed Action

Wells and related facilities would be visible from Hanna Draw Road; disturbances within the pipeline corridor would be visible from I-80, State Highways 72 and 30/287, and other roads in and adjacent to the HDEPA. However, these facilities are not anticipated to attract an observer's attention. Project development siting and coloration would be coordinated with BLM during on-site investigations conducted during APD and ROW application field reviews, and, as such, facilities would be sited, designed, and colored to comply with VRM objectives.

4.6.2 The No Action Alternatives

Under the No Action Alternative, visual resources would not be affected by exploration on federal lands or by pipeline construction. Effects on visual resources would be reduced to those created by the use of the two roads.

4.6.3 Mitigation

BLM would recommend that facilities be sited below ridge lines and screened from known vantage points. This additional mitigation would reduce the visibility of facilities to the casual observer.

4.7 HAZARDOUS MATERIALS

Impacts resulting from hazardous materials would be significant if these materials were produced, used, stored, transported, or disposed of in violation of federal or state law and/or as required by SPCC Plans.

4.7.1 The Proposed Action

Impacts to air, soils, surface water, and wildlife may result from accidental hazardous material spills, pipeline ruptures, and/or exposure to these materials. It is likely that only small amounts of soil may be contaminated and, if this occurred, affected areas would be cleaned up in an appropriate and timely manner. Proper containment of oil and fuel in storage areas, containment of fluids in reserve pits, appropriate gas and water line and pipeline design and construction, proper well casing and cementing, and location of wells away from drainages would prevent potential surface- and ground-water contamination (Section 2.1.13.9). Project operations would comply with all relevant federal and state laws regarding hazardous materials and with directives identified in project- and/or site-specific SPCC Plans. Birds and mammals would be excluded from reserve pits that contain potentially harmful substances by installation of fences and/or netting (Section 2.1.13.15).

The partial removal of ground water from coal seams during CBM development may make more oxygen available in the dewatered coal seams, thus contributing to conditions suitable for spontaneous coal combustion. However, the coal seams proposed for dewatering are about 5,000 ft deep and do not outcrop in the HDEPA. At this depth, ground water in the coal seams is under pressure. Water levels in wells completed in the HDEPA coals of interest rise to above

the coal layers, creating a hydraulic head in wells. The partial removal of water from coal seams during CBM development depressurizes the coal seam and reduces this hydraulic head, but this action is not likely to leave the coal seams in a condition where oxygen replaces water and results in spontaneous combustion (BLM 1999d).

Methane migration is highly unlikely because of the depth of the coal seams in the HDEPA. Methane would also be controlled through the implementation of APD conditions of approval that address well control, casing, ventilation, and plugging procedures appropriate to site-specific CBM development plans.

4.7.2 The No Action Alternative

Under the No Action Alternative, impacts due to hazardous materials would occur on federal lands if any spills occur during hazardous materials transportation across federal lands during CBM development on private lands.

4.7.3 Mitigation

If hazardous materials are present within fracturing fluids, the BLM may deny the discharge of these fluids to reserve pits. This additional mitigation would ensure that no wildlife, livestock, or other living organisms are inadvertently exposed to hazardous materials.

4.8 UNAVOIDABLE ADVERSE IMPACTS

Under the Proposed Action, unavoidable adverse impacts (i.e., impacts that cannot be completely mitigated) include the extraction and use of CBM, a nonrenewable resource. An estimated 162.7 acres of federal surface would be disturbed in the short-term, and 39.7 federal acres would be disturbed in the long-term. This disturbance would remove native vegetation, provide opportunities for noxious weed invasion, disturb soils, and result in increased erosion due to wind and water. Some increased runoff and sediments would likely reach local waterways. Surface disturbance would also reduce the amount of native habitat available to wildlife, would

reduce the amount of livestock forage, and may reduce recreational opportunities. Additional temporary impacts to wildlife would occur due to noise and human activity, especially during construction, drilling, and testing and, if the exploration project is successful, from long-term compressor noise. Minor reductions in air quality due to particulate, combustion engine, gas venting, and compression emissions would occur in the short-term, especially during construction and in the long term during operations. Minor changes in topography would occur due to cuts and fills associated with roads and well pad construction. Some loss of unidentified artifacts and/or fossils may occur, and some loss of visual quality would occur. Small spills of, or exposure to, hazardous materials may occur. Under the No Action Alternative, some economic benefits would be lost.

4.9 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

An irreversible and irretrievable commitment of resources is defined as a permanent reduction or loss of a resource that, once lost, cannot be regained. The primary irreversible and irretrievable commitment of resources from the proposed project would be the removal and use of the CBM reserves. Other irreversible and irretrievable commitments of resources would include soil lost through wind and water erosion; inadvertent or accidental destruction of paleontological or cultural resources during construction and/or increases in illegal collecting; loss of animals due to mortality during earth-moving activities or by collisions with vehicles; and labor, materials, and energy expended during construction, drilling, production, and reclamation activities associated with the project.

4.10 SHORT-TERM USE OF THE ENVIRONMENT VS. LONG-TERM PRODUCTIVITY

For the purposes of this EA, short-term use of the environment is that use during the LOP, whereas long-term productivity refers to the period after the project is completed and the area is reclaimed and revegetated. Short-term use of the environment would not affect the long-term productivity of the HDEPA or adjacent areas. After the project is completed and disturbed areas are reclaimed, the same resources that were present prior to the project would be available, except for the gas and water that has been removed. Dewatered coal seams would slowly

recharge; however, the rate of recharge is currently unknown. It may take 20 years or more after the project is abandoned for some of the reclaimed areas to attain shrub conditions comparable to predisturbance levels; however, reclamation would provide conditions to support wildlife, livestock, and recreation. Use of the HDEPA during the LOP would not preclude the subsequent long-term use of the area for any purpose for which it was suited prior to the project.

4.11 CUMULATIVE IMPACTS ASSESSMENT

Cumulative impacts are those that would result from the incremental impacts of the proposed project added to past, present, and reasonably foreseeable future actions. Cumulative impact assessment areas (CIAAs) vary among resources and are generally based on relevant landscape, resource, project, and/or jurisdictional boundaries (Table 4.3).

4.11.1 Reasonably Foreseeable Development

Reasonably foreseeable development is that development likely to occur within the HDEPA or the CIAA within the next 5 years. No reasonably foreseeable developments are known, other than the Proposed Action and development of wells and other facilities on private land. If more development is proposed in the future, additional NEPA analyses, including cumulative impact assessments, would be conducted.

Although SeaWest Windpower, Inc. (SeaWest) holds a ROW to construct and operate wind turbines and related facilities in the Simpson Ridge Vicinity, no wind power development in this area has been proposed for the reasonably foreseeable future. SeaWest has developed the Foote Creek Rim portion of the wind power project, located about 35 mi southeast of the HDEPA. Arch Minerals may develop a coal mine in the Carbon Basin immediately east of the proposed interconnect pipeline (BLM 1998a), although the state has not yet permitted the proposed mine, so the schedule for development is presently unknown. The MetFuel project (BLM 1993) was never developed, and Williams now holds the CBM leases for this area. Two coal mines near Hanna will continue to operate during the life of the exploration project; four are currently being reclaimed.

Table 4.3 Cumulative Impact Assessment Areas.

Resource	Cumulative Impact Assessment Area (CIAA)
Air Quality	Laramie Air Basin
Topography/Physiography	Hanna Mining District
Geology (general)	
Mineral Resources	Hanna Mining District
Geologic Hazards	Hanna Mining District
Paleontological Resources	Hanna Mining District
Soils	Hanna Mining District
Water Resources	
Surface Water	Project affected watersheds
Ground Water	Project-affected aquifers within the HDEPA
Noise and Odor	HDEPA and 1-mi buffer
Vegetation	
Plant Communities	Hanna Mining District
Wetlands/Riparian Areas	Project-affected watersheds within HDEPA
Wildlife and Fisheries	
Big Game	Affected herd units
Other Mammals	HDEPA and 2-mi buffer
Greater Sage-Grouse	Upland Game Bird Management Area 6
Raptors	HDEPA and 1-mi buffer
Fisheries	North Platte River Watershed
Other Species	HDEPA
Threatened, Endangered, Proposed, Candidate, and Other Sensitive Animal and Plant Species	Range of various species
Cultural Resources	Hanna Mining District
Socioeconomics	Carbon County
Landownership and Use	HDEPA
Aesthetics and Visual Resources	Hanna Mining District

4.11.2 Cumulative Impacts

Past actions on or in the vicinity of the HDEPA that continue today and have major influences on the area include the existing nine CBM wells and associated features; the 190-acre water containment reservoir; the Hanna Draw Road and other roads that allow access to the area; the six coal mines; and livestock grazing. Compared to many other parts of the U.S., however, the HDEPA and vicinity remains relatively undeveloped.

For the purpose of this analysis, quantifiable cumulative disturbance estimates resulting from this proposed project in combination with other past, present, and reasonably foreseeable developments include all proposed project developments (i.e., all existing and proposed developments on both public and private lands within the HDEPA) and the existing Hanna Basin coal mines. Proposed and existing disturbance from the proposed project includes an initial disturbance of 344.1 acres and an LOP of 70.0 acres, plus the 190-acre produced water containment reservoir (Table 4.4). Existing disturbance from the six coal mines totals 3,076 acres (Table 4.5). Therefore, total quantifiable initial and LOP cumulative disturbance for this project would be 3,614.1 acres and <3,340.0 acres, respectively. Four of the coal mines are no longer mining and are completing final reclamation, so the cumulative disturbance associated with the mines should decrease over the LOP.

4.11.2.1 Air Quality

The Continental Divide/Wamsutter II air quality study (BLM 1999a, 1999b) demonstrated that both short- and long-term total predicted TSP, PM₁₀, SO₂, CO, volatile organic compounds (VOC), hazardous air pollutants (HAPs), and NO₂ concentrations would comply with applicable air quality standards (i.e., WAAQS and NAAQS) as a result of direct, indirect, and cumulative project emissions (including construction and operation). Analyses presented in the Pinedale Anticline air quality studies (BLM 1999c) found no significant impacts to near-field air quality

Table 4.4 Disturbance Due to Mineral Development in the Hanna Mining District.

Development	Initial Acreage	LOP Acreage
6 coal mines	3,076.0 ¹	<3,076.0 ¹
9 existing private wells	10.8 ¹	2.7 ¹
7 proposed private wells	8.4 ¹	2.1 ¹
Existing CBM roads, private land	14.5 ¹	7.3 ¹
Proposed CBM roads, private land	36.4 ¹	18.2 ¹
CBM water containment reservoir	190.0	190.0
Subtotal	3,336.1	<3,296.3
Additional Proposed Action Disturbance		
9 federal wells	10.8 ¹	2.7 ¹
Existing federal road ROWs	23.7 ¹	23.7 ¹
Proposed federal road ROWs	26.7 ¹	13.3 ¹
Proposed interconnect pipeline ²	212.8 ¹	0 ¹
Subtotal	274.0	39.7
Cumulative Disturbance	3,610.1	<3,336.0

¹ The sum of these disturbances is 344.1 acres initially and 70.0 acres for the LOP.

² Includes federal and private land.

Table 4.5 Hanna Basin Coal Mine Existing Disturbance.

Area	Seminole II	Seminole I	Rosebud	Shoshone I	Medicine Bow	Vanguard
Permit Area	9,631	14,761	12,670	5,265	20,352	13,250
Approved to Affect	3,750	4,547	6,727	738	5,765	2,021
Disturbed to Date	3,556	4,534	4,047	383	5,740	2,011
Reclaimed	2,813	4,534	4,017	114	3,734	1,993
Remaining Disturbed	753	0	30	269	2,006	18

standards at well densities of 16 wells per 640-acre section. The coal mines have had to adhere to the stipulations for air quality protection required by their air quality permits. Therefore, coal mining, the proposed project (16 new wells), other existing development (seven wells and the water containment reservoir), and foreseeable development, are not anticipated to result in the degradation of air quality in the Laramie Air Basin or elsewhere.

4.11.2.2 Topography/Physiography, Soils, Surface Water, and Vegetation

Past, proposed, and reasonably foreseeable actions would require restoration of disturbed areas (3,614.1 acres) to predisturbance conditions. Reclamation of private lands would be at the discretion of the landowner and, while it is reasonable to believe that the landowner would require the same reclamation and revegetation standards as the BLM, this would be a matter to be decided by Williams and the affected landowner. Each mine is required to regrade the land to an approved post-mining topography in conformance with Wyoming statutes. Topographic alterations from CBM exploration, such as disturbances from well pads, access roads, the water containment reservoir, and the interconnect pipeline may remain for several years; however, these changes generally affect a very small portion of the total land surface (3.0% of the HDEPA).

The exploration area lies within watershed no. 10180004 (Missouri River, subregion 18, accounting unit 00, cataloguing unit 05), which includes very small portions of one surface mine and the towns of Elk Mountain, Medicine Bow, McFadden, Arlington, and Rock River. Other developments within this watershed include a small portion of one surface coal mine, the UPRR, Interstate 80, State Highways 30/287 and 13, numerous other paved and gravel roads, SeaWest's Foote Creek Rim wind plant, and possibly some clear cuts in the Medicine Bow Mountains. All of these developments affect surface water quality to a small degree--run off from gravel and two-track roads probably contribute most to any surface water impacts. However, the towns implement stormwater runoff control plans, as do the developments requiring federal, state, or county approval, so cumulative impacts to surface water quality are expected to be within acceptable levels. Standard stipulations and project- and site-specific construction and reclamation procedures are required on federal lands to maintain surface drainage patterns,

and these procedures require implementation of reclamation that includes regrading and re-contouring disturbed areas to approximate original conditions, re-establishing appropriate vegetative cover, protecting soils from erosion, and stabilizing reclaimed landscapes. These precautions likely would minimize cumulative impacts to topography, soils, surface water, and vegetation. However, protection of these resources on private lands would be determined by Williams and the landowner, and all mitigation and applicant-committed practices implemented for the Proposed Action may not be included in agreements between Williams and the landowner and therefore not implemented on private surface. Weed control on private lands would be implemented by Williams, pursuant to landowner specifications and state and county regulations governing weed control.

4.11.2.3 Geologic Hazards, Ground Water, Noise and Odors, Land Use, and Hazardous Materials

Cumulative impacts from geologic hazards and to ground water, noise and odor, hazardous materials, and landownership and land use generally would be as described for the Proposed Action for these resources. However, since the level of development would be increased to 25 total wells and associated features, the magnitude of these impacts would be increased.

4.11.2.4 Minerals and Socioeconomics

The proposed project would result in a depletion of CBM resources in the area but would not interfere with the potential recovery of other minerals. Seams in which CBM is being produced are also being mined, but steep dips and faulting would not affect any of the seams currently mined. CBM development would add to the economic well-being of Carbon County, the State of Wyoming, and the U.S. because of increased revenues from job creation, spending, taxes, and royalties.

4.11.2.5 Cultural Resources

Disturbance and/or loss of unidentified sites or artifacts may add to the cumulative loss of information about our heritage in the HDEPA and throughout the region if these resources are

not identified, inventoried, and/or appropriately protected or mitigated. However, such losses are not expected since mitigation measures as identified for the Proposed Action (Section 2.1.13.3) have been implemented for the coal mines and would be implemented under all proposed and potential future regional development projects with federal involvement. In the absence of cultural resource clearances and/or other federally mandated cultural resource protection measures on private lands, increased impacts to cultural resources may occur.

4.11.2.6 Paleontology

With the application of appropriate mitigation (Section 2.1.13.4), cumulative impacts similar to those of cultural resources (Section 4.11.2.5) are anticipated for paleontological resources. The likelihood of disturbing paleontological resources would remain low; however, any fossils uncovered during construction might not be mitigated on private lands in the same way they would be under the Proposed Action, resulting in a loss of those fossils. In addition, natural erosion and illegal collection would continue at current levels.

4.11.2.7 Wildlife and Fisheries

Impacts to pronghorn and mule deer would be as described for the Proposed Action yet increased due to coal mining and private land developments. The minimal additional disturbance occurring within the Medicine Bow pronghorn herd crucial winter range to be affected by the exploration project includes roads, power lines, and portions of Seminoe Reservoir. Pronghorn and mule deer populations would be affected primarily by climatological conditions, especially drought and severe winter weather, and by WGFD harvest quotas. Most other mammal and bird populations would similarly be affected primarily by natural forces, especially the weather. Project developments (e.g., wells, roads, and the pipeline and water and gas gathering lines) may make management of greater sage-grouse and raptor populations more difficult. However, protection of greater sage-grouse leks and nesting habitat and raptor nests (on public land) are strictly enforced and would be applied on future projects to ensure existing populations are maintained. With the proper management of watersheds and produced water discharge (e.g.,

volume and constituent limitations) that may occur under full-field development, cumulative impacts to fish in the North Platte River watershed are not anticipated.

The proposed project may contribute some additional impacts (e.g., habitat loss and increased human presence) to the cumulative effects on black-footed ferret habitat from ranching, coal mining, oil and gas projects, and transportation or on prairie dogs (i.e., black-footed ferret prey base) from non-BLM pest control and recreational shooting, through habitat loss and increased access.

Cumulative impacts to the local mountain plover population, primarily through habitat loss and displacement, as a result of past, proposed, and future projects are unknown. Although disturbance due to ranching, coal mining, oil and gas development, and transportation has removed an unknown portion of potential mountain plover breeding and nesting habitat, the relatively small disturbance acreage (3,614.1 acres), the short-term nature of proposed project disturbances, and the apparent lack of habitat use by plover (TRC Mariah Associates Inc. 2001) make it unlikely that the proposed project, in combination with other regional actions, would jeopardize plover reproduction.

The proposed project may contribute some additional impacts through habitat loss, displacement, and increased human access to the cumulative effects on state-sensitive species from ranching, coal mining, oil and gas projects, and transportation or on prairie dogs (i.e., raptor prey base and burrowing owl habitat) from pest control and recreational shooting.

4.11.2.8 Aesthetics and Visual Resources

Impacts to visual resources from altered viewsheds (i.e., visible project development features--well locations, roads, gas and water lines, the interconnect pipeline, the reservoir, the compressor, the POD--and presence of dust) would increase as development occurs. Since four of the six mines are currently completing final reclamation, visual impacts from mining should diminish over time.
