
4.0 ENVIRONMENTAL IMPACTS

4.1 INTRODUCTION

In accordance with 40 C.F.R. 1502.16, this chapter discloses the environmental consequences of the Proposed Action and the No Action Alternative on each of the affected resources. 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 as a result of project-related activities. Impacts may be beneficial or adverse, may be a primary (direct) result or secondary (indirect) result of an action, and may be long-term (more than 5 years) or short-term (less than 5 years) in duration. Impacts may vary in degree from a slightly discernible change to a total change in the environment. This impact assessment assumes that all applicant-committed measures described in the Proposed Action would be successfully implemented. If such measures are not implemented, additional adverse impacts may occur.

Residual impacts are unavoidable impacts resulting from the Proposed Action after application of appropriate mitigation (BLM 1988).

Cumulative impacts result from the incremental impacts of an action added to other past, present, and reasonably foreseeable future actions, regardless of who is responsible for such actions. Cumulative impacts may result from individually minor, but collectively significant, actions occurring over a period of time (40 C.F.R. 1508.7). The cumulative impact assessment area (CIAA) for the CGIDP includes 10 Hydrologic Unit Code (HUC) Order 12 drainage basins totaling 61,618 acres. Nine of the drainage basins, encompassing 53,458 acres, are from the Cave Gulch EIS: Alkali Creek, Poison Creek, North Branch of Cave Gulch, Main Branch of Cave Gulch, South Branch of Cave Gulch, Waltman Draw, Upper Sand Draw, Sand Draw Tributaries, and Keg Springs Draw. Because the CGIDP added 1,920 acres to the south end of the original Cave Gulch EIS area, an additional portion of Sand Draw, delineated in the *Modified Cooper Reservoir Natural Gas Development Environmental Assessment* and totaling 8,160 acres, was added to the CIAA. This CIAA is used to analyze cumulative impacts for the following resources: cultural resources; geology, geologic hazards, and minerals; health, safety, and transportation; land use, including grazing and recreation; Native American religious concerns; paleontological resources; soils; TEPC and BLM-sensitive species; vegetation; visual resources; solid and hazardous wastes; and water resources. This is consistent with the analysis of cumulative impacts in the Cave Gulch EIS (BLM 1997a). Total disturbance, including the CGIDP, from past, present, and reasonably foreseeable future actions within the CIAA is 3,883 acres, whereas LOP disturbance totals 1,410 acres.

The CIAA for air quality includes Johnson, Washakie, Big Horn, Sheridan, and Natrona counties, whereas the CIAA for socioeconomic resources is Natrona County. The CIAAs for mule deer and pronghorn antelope are their respective herd units, and CIAA for small mammals, upland game birds, migratory birds, reptiles, amphibians, and fish is the CGIDP area.

Each resource discussed in this chapter includes a description of:

- impacts due to the implementation of the Proposed Action,
- impacts due to the implementation of the No Action Alternative,
- additional mitigation and monitoring measures,
- residual impacts, and
- cumulative impacts.

Impact analysis assumes that mitigation included in Appendices A and B of the Cave Gulch ROD is applied. The mitigation is incorporated by reference into this EA. It also assumes implementation of applicant-committed environmental protection measures listed in Section 2.2.14 and Appendix A of this EA.

4.2 PHYSICAL RESOURCES

4.2.1 Air Quality

The Cave Gulch EIS summarized impacts to air quality as follows.

- No violations of applicable Wyoming or federal air quality regulations or standards are expected to occur as a result of direct, indirect, or cumulative project emissions (including construction and operation.). The maximum potential air pollutant concentrations would occur close to, and between, well locations, even with the densest assumed well spacing. That is, the maximum ground level concentrations occurred so close to each well that adding additional wells in the field would not increase the overall maximum concentration.
 - Potential air quality impacts would be below applicable significance criteria for atmospheric deposition at the Cloud Peak Class II Wilderness Area.
 - Given the inherent conservatism in the analysis, operation emissions would not result in any perceptible visibility impact on the cleanest days at the Cloud Peak Class II Wilderness Area. This conclusion is based on an extremely clean assumed background
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standard visual range (374 km) and very conservative Interagency Workgroup on Air Quality Modeling (IWAQM) Preliminary Screening Analysis.

An extensive air quality impact assessment was documented in the 1997 *Cave Gulch Cumulative Air Quality Impact Analysis Technical Support Document* (TRC Environmental Corporation 1997) prepared as part of the Cave Gulch EIS.

The scope of the current project differs from the scope of the Cave Gulch EIS project in well numbers, well locations and densities, wellsite equipment, and compression emission rates, and these differences result in changes in projected air emissions.

4.2.1.1 Proposed Action

Emissions Inventory - Construction. Air pollutant emissions from the construction phase of the Proposed Action would result from construction of well pads and access roads, travel on unpaved roads, heavy construction equipment, drilling rig engines, and well completion. Specifically, particulate matter less than 10 microns in diameter (PM₁₀) and particulate matter less than 2.5 microns in diameter (PM_{2.5}) emissions would result from well pad and access road construction and travel on unpaved roads, and oxides of nitrogen (NO_x), carbon monoxide (CO), volatile organic compounds (VOC), and/or sulfur dioxide (SO₂) emissions would occur from drilling rig engine operation, tailpipe emissions from heavy construction equipment, and flaring operations during completion. Air pollutant impacts from each well would be temporary, occurring during the well construction/completion phase.

Emissions resulting from well pad construction for an individual well would not change from levels calculated in the Cave Gulch EIS and are presented in Table 4.1.

Emissions Inventory - Production. Emissions of PM₁₀, PM_{2.5}, NO_x, CO, VOC, SO₂, and hazardous air pollutants (HAPs) would occur from production facilities including glycol dehydrators and compressor engines. Emission-generating equipment proposed for each new well would include one 0.75 million British Thermal Units per hour (MMBtu/hr) separator and associated heater and one condensate storage tank.

Total production emissions calculated for the Proposed Action are provided in Table 4.2.

Table 4.1 Wellsite Construction Emissions Summary for a Single Well.¹

Activity	Pollutant	Single Well Emission Rate (lb/well)	Single Well Emission Rate (tons/well)
Resource Road/Well Pad Construction	PM ₁₀	1,031.31	0.52
	VOC	7.92	0.0040
	CO	29.21	0.015
	NO _x	114.54	0.057
	SO ₂	13.02	0.0065
Rig-up, Drilling, Rig-down	PM ₁₀	2,205.64	1.10
	VOC	516.50	0.26
	CO	1,381.50	0.69
	NO _x	6,275.20	3.14
	SO ₂	424.10	0.21
Completion and Testing	PM ₁₀	4,509.40	2.25
	VOC	9.40	0.0047
	CO	12,974.40	6.49
	NO _x	2,398.90	1.20
	SO ₂	1.60	0.0008

¹ Source: TRC (1997).

Table 4.2 Production Emissions Under the Proposed Action.

Activity	Pollutant	2004 Proposed - 30 mmscf/day (tpy)	2004 Proposed - 60 mmscf/day (tpy)
Wellsite Emissions	NO _x	44.7	44.7
	CO	14.9	14.9
	PM ₁₀	0.0	0.0
	SO ₂	0.0	0.0
	VOC	816.4	2,708.6
	Formaldehyde	0.0	0.0
	HAPs	17.45	59.7
Centralized Compression and Processing Facilities	NO _x	146.8	146.8
	CO	217.8	217.8
	PM ₁₀	0.0	0.0
	SO ₂	0.0	0.0
	VOC	62.4	67.8
	Formaldehyde	7.2	7.2
	HAPs	10.2	13.5
Total Annual Production Emissions	NO _x	191.5	191.5
	CO	232.7	232.7
	PM ₁₀	0.0	0.0
	SO ₂	0.0	0.0
	VOC	878.8	2,776.4
	Formaldehyde	7.2	7.2
	HAPs	27.7	73.2

Wellsite equipment specified for the Proposed Action varies from that analyzed in the Cave Gulch EIS due to the movement of the wellsite glycol dehydration units to centralized locations, a reduction in condensate production, and the use of one separator heater at each wellsite. This configuration is currently used at all existing wells and will be used at remaining wells authorized under the Cave Gulch ROD. It results in a reduction in emissions from levels reported in the Cave Gulch EIS. Horsepower requirements for compression in the Cave Gulch EIS project area have not changed, but advancements in the best achievable control technology (BACT) required under WDEQ/AQD regulations have resulted in the reduction of unit compressor engine emissions. These reductions in emissions, when applied to existing/authorized development and proposed development, result in field-wide reductions in emissions. Table 4.3 presents a summary of the change in emissions among pre-1997 existing wells plus development authorized as part of the 1997 EIS, all at emission rates analyzed in 1997, and pre-1997 existing wells, development authorized as part of the Cave Gulch EIS, and the 2004 Proposed Action, all at emission rates reflecting current field operations. This comparison was performed with the current field producing at both 30 million standard cubic feet per day (mmscf/day) and 60 mmscf/day.

Emissions Inventory - Wind Erosion. Emissions of particulate matter from wind erosion of disturbed areas were calculated for the Cave Gulch EIS and reflected emissions from surface disturbance. Total disturbed area under the 1997 proposal was 25,093 acres, and total proposed disturbed area under this EA is 27,013 acres, a 7.65% increase. Wind erosion emissions calculated for the 1997 EIS were 0.60 tons per year (tpy) PM_{10} and 0.24 tpy $PM_{2.5}$. Adjusting these by the total disturbed area results in total emissions of 0.65 tpy PM_{10} and 0.26 tpy of $PM_{2.5}$. $PM_{2.5}$ emissions are assumed to equal 40% of PM_{10} emissions based on guidance contained in AP-42 Chapter 13.2.5, Industrial Wind Erosion.

Ambient Impacts. A dispersion modeling analysis was performed for the Cave Gulch EIS to predict maximum near-field concentrations for comparison to ambient air quality standards. A representative well pad layout was modeled with the ISCST3 model and Casper surface station meteorological data to quantify impacts of PM_{10} and SO_2 emissions from construction and NO_x , CO, and HAP emissions from production. Ambient background concentrations reflective of existing conditions in the region, which are added to modeled concentrations to determine total impacts, have been updated to current recommended values for all pollutants and are shown in Table 4.4.

Construction emissions would be short-term and localized in nature, occurring at individual construction sites. PM_{10} , $PM_{2.5}$, and SO_2 construction impacts calculated in the original Cave Gulch EIS remain representative of a reasonable worst-case scenario and are shown in Table 4.5.

Table 4.3 Production Emissions - Change in Total Field.

Activity	Pollutant	Existing Field Pre-1997 + 1997 Authorized (tpy)	Proposed 2004 (30 mmscf/day) ¹ (tpy)	Proposed 2004 (60 mmscf/day) ¹ (tpy)	Emission Change from 1997 to 2004 (30 mmscf/day) (tpy)	Emission Change from 1997 to 2004 (60 mmscf/day) (tpy)
Wellsite Emissions	NO _x	274.5	105.3	105.3	(169.2)	(169.2)
	CO	834.6	35.1	35.1	(799.5)	(799.5)
	PM ₁₀	--	--	--	--	--
	SO ₂	--	--	--	--	--
	VOC	5,562.4	816.4	2,708.6	(2,853.8)	(2,853.8)
	Formaldehyde	0	0	0	0	0
	HAPs	240.4	17.45	59.7	(180.7)	(180.7)
Centralized Compression and Processing Facilities	NO _x	290.0	146.8	146.8	(143.2)	(143.2)
	CO	580.0	217.8	217.8	(362.2)	(362.2)
	PM ₁₀	--	--	--	--	--
	SO ₂	--	--	--	--	--
	VOC	145.0	62.4	67.8	(77.2)	(77.2)
	Formaldehyde	17.4	7.2	7.2	(10.2)	(10.2)
	HAPs	17.4	10.2	13.5	13.5	13.5
Total Annual Production Emissions	NO _x	564.5	252.1	252.1	(312.4)	(312.4)
	CO	1,414.6	252.9	252.9	(1,161.7)	(1,161.7)
	PM ₁₀	--	--	--	--	--
	SO ₂	--	--	--	--	--
	VOC	5,707.4	878.8	2,766.4	(4,828.6)	(2,931.0)
	Formaldehyde	17.4	7.2	7.2	(10.2)	(10.2)
	HAPs	240.4	27.7	73.2	(212.8)	(167.2)

¹ Includes emissions from 202 existing/authorized wellsites within the field.

Table 4.4 Summary of Pollutant Background Concentrations.

Pollutant	Averaging Period	Current Background Concentration (µg/m ³)	Data Source Current Background	Current Value Collection Period
CO	1-Hour	3,336	Amoco Ryckman Creek	1978-1979
	8-Hour	1,381		
NO ₂	Annual	5.0	WDEQ: Thunder Basin	2002
Ozone (O ₃)	1-Hour	162	WDEQ: Thunder Basin	2001-2002
	8-Hour	150		
SO ₂	3-Hour	93	Lost Cabin	1986-1987
	24-Hour	32		
	Annual	4		
TSP	24-Hour	N/A	N/A	--
PM ₁₀	24-Hour	33	WDEQ: Cheyenne	2001
	Annual	16		
PM _{2.5}	24-Hour	13	WDEQ: Cheyenne	2001
	Annual	5		

Table 4.5 Construction Impacts Summary.¹

Pollutant	Averaging Period	1997 Modeled Impact ($\mu\text{g}/\text{m}^3$)	Current Background Concentration ($\mu\text{g}/\text{m}^3$)	Total Concentration ($\mu\text{g}/\text{m}^3$)	WAAQS/NAAQS ($\mu\text{g}/\text{m}^3$)
PM ₁₀	24-Hour	24.2	33	57.2	150
	Annual	5.3	16	21.3	50
PM _{2.5} ²	24-Hour	12.1 ¹	13	25.1	65
	Annual	2.7 ¹	5	7.7	15
SO ₂	3-Hour	70.7	93	163.7	1300/1300
	24-Hour	20.3	32	52.3	260/365
	Annual	3.8	4	7.8	60/80

¹ Source: TRC Environmental Corporation (1997).

² PM_{2.5} concentrations estimated as 50% of PM₁₀ modeled concentrations in the absence of modeling results for this pollutant.

NO_x and CO impacts from production activities were modeled in 1997 using calculated emissions from wellsites and compressor engines. As discussed previously, advancements in BACT for compressor engines has resulted in a reduction in unit emissions from levels analyzed in 1997, and compressor engines are the primary emissions sources modeled to determine NO_x and CO concentrations. The impact assessment performed in 1997 has been revised to account for the source-specific change in emissions for each of the modeled pollutants shown in Table 4.3. The revised concentrations were calculated based on the reasonable assumption that modeled impacts change in direct relationship to modeled emission rates. NO_x emissions from compression analyzed in 1997 were 290.0 tpy and CO emissions were 580.0 tpy. Using BACT currently applied to permitted engines in the field, NO_x and CO emissions from total compression proposed in the field would equal 146.8 tpy NO_x and 217.8 tpy CO. These values represent a 50.6% decrease in NO_x emissions and a 37.5% decrease in CO emissions compared to levels predicted in 1997. These reductions were applied directly to modeled emissions to derive adjusted impacts, expressed as NO₂ and CO (Table 4.6). NO₂ and CO concentrations plus background are less than WAAQS/NAAQS, and the NO₂ concentration is less than the NO₂ PSD Class II Increment. Note that proposed compression is identical for both the 30 mmscfd and 60 mmscfd field production rates; therefore, NO_x and CO emissions are identical for both. Emissions of wellsite HAPs (n-hexane, benzene, toluene, ethylbenzene and xylene) were modeled in 1997 and found to be below short-term (acute) exposure levels in existence at that time as reflected by a range of various states' Acceptable Ambient Concentration Levels (AACLs). Updated Environmental Protection Agency (EPA) data is now used, including 1-hour EPA Reference Exposure Levels (RELs) for benzene, toluene, xylene, and

Table 4.6 Production NO₂ and CO Impacts.¹

Pollutant	Averaging Period	1997 Modeled Impact (µg/m ³)	2004 Adjusted Modeled Impact (µg/m ³)	Current Background Concentration (µg/m ³)	Total Concentration (µg/m ³)	WAAQS/NAAQS (µg/m ³)	PSD Class II Increment (µg/m ³)
CO	1-Hour	1,020	377.4	3,336	3,713.4	40,000	--
	8-Hour	727	269.0	1,381	1,650.0	10,000	--
NO ₂	Annual	22.3	11.3	5.0	16.3	100	25

¹ Source: TRC Environmental Corporation (1997).

formaldehyde and 1-hour EPA Immediately dangerous to life or health (IDLH) values for ethylbenzene and n-hexane. Table 4.3 demonstrates that wellsite HAP emissions have decreased due to the removal of wellsite glycol dehydration and the installation of a centralized dehydration facility at the compressor locations. As a result, modeled short-term HAP concentrations quantified in 1997 are assumed to represent a conservative estimate of impacts that would occur under the Proposed Action and are presented in Table 4.7. As shown in Table 4.3, formaldehyde emissions from compressor engines would decrease from levels analyzed in 1997. Eight-hour concentrations of benzene, toluene, ethylbenzene, xylene, n-hexane, and formaldehyde are converted to 1-hour concentrations using standard conversion guidance (EPA 1997) and compared to applicable 1-hour EPA RELs or IDLH values (Table 4.7).

In addition, long-term (annual) exposures to HAPs are compared to reference concentrations for chronic inhalation (RFCs) for non-carcinogenic effects on human health (Table 4.8). Modeled 8-hour concentrations of toluene, xylene, ethylbenzene, and n-hexane from the 1997 study are converted to annual concentration values using standard conversion guidance. All concentrations are below the applicable RFC (Table 4.8).

Long-term exposures to emissions of suspected carcinogens (benzene and formaldehyde) were also modeled in the 1997 study. Cancer risks for the most likely exposure (MLE) and the maximally exposed individual (MEI) were calculated from the modeled concentrations. The predicted annual concentrations were 0.09 µg/m³ (benzene) and 0.28 µg/m³ (formaldehyde). Using the benzene and formaldehyde concentrations from the 1997 study, the estimated MLE scenario cancer risk for benzene (7E-08), formaldehyde (4E-07) and the total MLE cancer risk (5E-07) are below the acceptable range of 1E-04 to 1E-06. Under the MEI scenario, both the individual cancer risks for benzene and formaldehyde (2E-07 and 1E-06) are less than or equal to 1E-6, and the total cancer risk for the inhalation pathway is 1E-6.

Table 4.7 Short-Term HAP Impacts.

Pollutant	1997 Modeled 8-Hour Concentration ($\mu\text{g}/\text{m}^3$)	1997 Modeled 1-Hour Concentration ($\mu\text{g}/\text{m}^3$)	REL/IDLH ¹ ($\mu\text{g}/\text{m}^3$)
Benzene	10.4	14.9	1,300
Toluene	46.6	66.6	37,000
Ethylbenzene	10.4	14.9	35,000
Xylene	42.7	61.0	22,000
n-hexane	72.5	103.6	39,000
Formaldehyde	13.7	19.6	94

¹ EPA Air Toxics Database, Table 2 (EPA 2003).

Table 4.8 Long-Term HAP Impacts.

Pollutant	Annual Concentration ($\mu\text{g}/\text{m}^3$)	Non-Carcinogenic RFC ¹ ($\mu\text{g}/\text{m}^3$)
Benzene	0.09	30.0
Toluene	6.7	400.0
Ethylbenzene	1.5	1,000.0
Xylenes	6.1	100.0
n-Hexane	10.3	200.0
Formaldehyde	0.28	9.8

¹ EPA Air Toxics Database, Table 1 (EPA 2003).

Ozone (O_3) is formed as a result of chemical reactions involving ambient concentrations of VOCs and NO_x . The 1997 air quality study demonstrated that VOC and NO_x emissions resulting from a group of eight wells and a nearby compressor station would not cause or contribute to an exceedance of the hourly NAAQS for ozone ($235 \mu\text{g}/\text{m}^3$). Because overall field emissions of NO_x and VOCs would be less than what was analyzed in the 1997 study, there would be less potential for ozone formation and lower expected ozone concentrations.

4.2.1.2 The No Action Alternative

Under the No Action Alternative, the BLM would deny the CGIDP, and no additional disturbance/development would occur beyond that which has already been approved by the BLM. There would be no additional impacts to ambient air quality beyond those previously analyzed in the Cave Gulch EIS, and those impacts, as previously explained, would be reduced due to advances in BACT for compressor engines.

4.2.1.3 Mitigation and Monitoring

In addition to mitigation presented in Appendix A of the Cave Gulch ROD, BACT would be applied for reciprocating internal combustion engines, condensate storage, and other applicable emission sources to reduce air emissions in accordance with Wyoming Air Quality Standards and Regulations (WAQSR) Section 2(c)(v) and WDEQ/AQD guidance for oil and gas sources.

4.2.1.4 Residual Impacts

Some increase in emissions would occur as a result of the Proposed Action. However, dispersion modeling of these emissions predicts impacts below applicable significance thresholds.

4.2.1.5 Cumulative Impacts

A cumulative air quality impact assessment was performed for the Cave Gulch EIS and documented in the *Cave Gulch Cumulative Air Quality Impact Analysis Technical Support Document* (TRC Environmental Corporation 1997). The analysis assessed the potential cumulative emissions of NO_x and SO₂ from the Cave Gulch EIS project area and six emission sources, identified from WDEQ/AQD air permitting records, to be located within an area which included Johnson, Washakie, Big Horn, Sheridan, and Natrona counties. Modeling of potential cumulative emissions was performed to quantify NO₂ and SO₂ emissions at the Cloud Peak Wilderness Area boundary (a PSD Class II area) and at a U.S. Forest Service (USFS)-identified sensitive lake (Florence Lake). Potential nitrogen and sulfur deposition and regional visibility impacts at the Cloud Peak Wilderness Area and changes in acid-neutralizing capacity (ANC) at Florence Lake were calculated. PSD Class II areas such as Cloud Peak Wilderness Area have no visibility protection under state or federal law but were identified as sensitive area for the purposes of the analysis.

A net overall decrease in production NO_x emissions of 44.7% has been shown to result from changes in field production as documented in Section 4.2.1.1. Therefore, the analysis that was performed in 1997 predicted emissions greater than those anticipated from the current project design when combined with identical regional sources. The 1997 analysis demonstrated that the maximum predicted change in visibility resulting from cumulative emissions impacts would be 0.4 deciview, which is below the current Federal Land Managers' Air Quality-Related Values Workgroup cumulative analysis threshold of a

1.0 deciview or 10% change in light extinction. The maximum potential change in ANC at Florence Lake was predicted to be 0.02%, well below the USFS threshold value of 10%.

4.2.2 Geology, Geologic Hazards, and Minerals

The Cave Gulch EIS concluded that the inherent geologic hazards in the project area did not pose a significant danger or public safety hazard and that impacts related to natural geologic hazards would not likely occur as a result of project-related activities. The Cave Gulch EIS concluded that no major mineral resources would be impacted other than oil and natural gas reserves.

4.2.2.1 Proposed Action

The Proposed Action would not impact the basic geology of the CGIDP area, and the inherent geologic hazards in the CGIDP area do not pose a significant danger or public safety hazard. Therefore, impacts related to natural geologic hazards would not likely occur due to topographic alterations resulting from project-related activities. As discussed in Section 3.3.2.1 of this EA, no major landslide areas have been identified within the CGIDP area, and construction activities would not likely initiate landslides, mudslides, debris flows, slumps, or other forms of mass-wasting. Seismic activity in the CGIDP area is low; therefore, the potential for damage of project-related facilities would be low. There would be minimal risk that the Proposed Action would initiate any seismic activity.

The primary impact on mineral resources would be the removal of additional reserves of natural gas from the Tertiary Wind River and Fort Union Formations and the Cretaceous Lance/Meeteetse, Frontier, Muddy, and Cloverly formations. As a result, these resources would not be available in the future.

There are no known solid mineral leases (i.e., coal), locatable mineral mines (e.g., precious metals, bentonite, etc.), economically recoverable deposits of locatable minerals, or active construction aggregate quarries, and there are no claims for any locatable minerals within the CGIDP area. Therefore, the Proposed Action would have no impacts on these resources, and no development conflicts are anticipated. If conflicts were to arise, development priorities would conform to existing federal law and BLM policies and regulations.

4.2.2.2 No Action Alternative

Under the No Action Alternative, no additional disturbance/development would occur beyond that which has already been approved by the BLM, and there would be no additional impacts to geology and geologic hazards. Exploration for and development of natural gas as currently proposed by the Operators within the CGIDP area would not occur beyond those levels previously authorized by the BLM in the Cave Gulch EIS. However, natural gas exploration and development on private and state lease areas could continue and would likely result in the drainage of some natural gas from adjacent federal mineral estate with the consequential loss of revenue (reduction in mineral royalties paid) to the federal government. Under the No Action Alternative, some of the natural gas reserves on federal lands within the CGIDP area could remain available for future recovery. However, an extensive delay in the development of the federal leases could render some of these reserves unrecoverable and would result in the ultimate waste of natural gas reserves within the affected federal leases. Other mineral resources located on federal lands would not be impacted and could be developed in the future based on product availability, demand, and federal land management policies.

4.2.2.3 Mitigation and Monitoring

No additional mitigation or monitoring is recommended.

4.2.2.4 Residual Impacts

The Proposed Action would not result in any residual impacts to geology, geologic hazards, or minerals.

4.2.2.5 Cumulative Impacts

Cumulative disturbance in the CIAA total 3,883 acres. None of the disturbance would affect landslide deposits or be likely to trigger geologic hazards such as landslides, mudslides, debris flows, or slumps; therefore, there would be no incremental increase associated with geologic hazards. The same is true regarding mineral resources--none of the projects would impact other mineral resources, and there would be no cumulative impacts.

4.2.3 Paleontological Resources

The Cave Gulch EIS concluded that project-related construction activities could result in the exposure and possible destruction of fossil resources, as well as associated geologic information. Accelerated erosion could also adversely affect fossil resources. However, the magnitude of adverse impacts to fossils could be reduced and beneficial impacts fostered by the application of appropriate mitigation measures.

4.2.3.1 Proposed Action

Under the Proposed Action, approximately 766 acres of additional surface disturbance would occur. Approximately 8% (or 2,111 acres) of the CGIDP area has been designated as having a high potential for the occurrence of scientifically important fossils. Prior to the initiation of project-related activities, the Operators would have a qualified paleontologist collect a representative sample of fossil remains from the surface and from anthills in the areas of proposed disturbance having a high potential for important fossils. That material would be evaluated, curated, and documented as described in Appendix A of the Cave Gulch ROD.

The remaining 92% of project area has a low probability for the occurrence of scientifically important fossils. However, to mitigate the potential loss of unanticipated scientifically important fossils, the Operators would inform all field personnel not to search for, scavenge, or remove any paleontological resources while working on the project. In addition, if new fossils are discovered during surface-disturbing activities, work would cease until the fossil find was evaluated and appropriate mitigation performed, which may include recording and recovery of the fossil material or delaying continued construction until full recovery can be completed. Because of these mitigation measures, impacts to paleontological resources would be negligible to low.

4.2.3.2 No Action Alternative

Under the No Action Alternative, the BLM would deny the Proposed Action, and no additional disturbance/development would occur beyond that already authorized by the BLM. There would be no adverse impacts to paleontological resources as a result of the CGIDP. However, sampling efforts associated with mitigation for surface-disturbing activities would not occur, and additional fossils may not be discovered.

4.2.3.3 Mitigation and Monitoring

No additional mitigation or monitoring is recommended.

4.2.3.4 Residual Impacts

Some fossils could be destroyed during the course of surface-disturbing activities because most of the fossils are quite small.

4.2.3.5 Cumulative Impacts

There are no known areas within the CIAA that have a high probability of scientifically important fossils other than those identified in the original Cave Gulch EIS project area; therefore, implementation of the Proposed Action and the Cave Gulch EIS project would be the only source of impacts to scientifically important paleontological resources. Mitigation in the Cave Gulch EIS and this EA would minimize adverse impacts to fossils and could result in the identification of important fossils.

4.2.4 Soils

The Cave Gulch EIS concluded that “Assuming avoidance of sensitive soils to the maximum extent practicable, effective surface runoff, erosion, and sedimentation control combined with effective revegetation would reduce the severity of adverse impacts to non-significant levels.” The Cave Gulch ROD (Appendix A, Section 8.3) required that the Operators “avoid to the maximum extent possible sensitive soils, areas with poor and very poor reclamation potential, and slopes in excess of 15 percent.”

4.2.4.1 Proposed Action

Under the Proposed Action, construction-related activities could result in removal of native vegetation, exposure of the soil, mixing of soil horizons, loss of topsoil productivity, soil compaction, and increased susceptibility to wind and water erosion. These impacts could, in turn, result in increased runoff, soil erosion, and sedimentation to receiving waters.

Under the Proposed Action, a total of 766 additional acres of soil resources would be disturbed over the life of the project. Approximately 510 acres would be reclaimed within 1 to 2 years following initial

disturbance, whereas the remaining 256 acres would be LOP disturbance. After reclamation has been successfully completed, soil stability would be achieved and soil erosion rates would be expected to return to pre-disturbance levels in 3 to 5 years.

Control of surface runoff and sedimentation would be accomplished by implementation of best management practices/mitigation measures specified in Appendix A of the Cave Gulch ROD and incorporated herein by reference. These mitigation measures include, but are not limited to, appropriate design and construction techniques to minimize disturbance; installation of culverts for the crossing of drainage channels; avoidance of disturbance within 100 ft of riparian area (except at drainage crossings); and salvaging and stockpiling topsoil for future use in reclamation. In addition, the Operators would, during the site-specific planning process, avoid to the maximum extent possible sensitive soil areas, areas with poor and very poor reclamation potential, and slopes in excess of 15%.

In accordance with the Cave Gulch ROD, the Operators have conducted qualitative monitoring of soil erosion and stability of disturbed areas associated with natural gas development. Erosion monitoring conducted in 2003 (the last year for which information is available) by the BLM reported that 13 of the 15 monitored sites were meeting erosion control objectives with only minor maintenance required. Two sites were in need of significant remediation work, and the Operators were advised of the situation. The Operators would continue to monitor disturbed and reclaimed areas to document soil stability and determine if erosion control measures are functioning as anticipated. The BLM reported that erosion control measures have proven effective, and that soil stability was generally good (BLM 2003). The impacts to soil resources from the Proposed Action would likely be similar to those reported in the monitoring studies, and impacts would be low.

The precise location of the wells that would be drilled in conjunction with the Proposed Action is not available at this time. However, assuming that the wells are geographically distributed in approximately the same manner as the wells drilled under the Cave Gulch EIS, the total disturbance, LOP disturbance, and percent of LOP disturbance in each watershed that would occur in the CGIDP is presented in Table 4.9.

It is unlikely that well distribution would be similar to that resulting from the Cave Gulch EIS; rather, it is likely that less disturbance would occur in the core area and more would occur in some of the watersheds that have fewer wells, such as the watersheds in the southern portion of the CGIDP area.

Table 4.9 Surface Disturbance in Watersheds in the CGIDP Area.

Well Location	Total Disturbance (acres)	LOP Disturbance (acres)	Percentage of LOP Disturbance
Alkali Creek	56	21	1.2
Poison Creek	303	85	2.0
North Branch Cave Gulch	264	93	2.7
Main Branch Cave Gulch	756	281	9.3
South Branch Cave Gulch	242	87	3.2
Waltman Draw	791	247	5.9
Sand Draw	201	51	1.4
Sand Draw Tributary	91	46	2.3
Keg Springs Draw	40	8	1.4

4.2.4.2 No Action Alternative

Under the No Action Alternative, the BLM would deny the Proposed Action, and no additional disturbance would occur beyond that already authorized. Impacts to soil resources within the Cave Gulch EIS project area would continue at current rates.

4.2.4.3 Mitigation and Monitoring

No additional mitigation or monitoring is recommended.

4.2.4.4 Residual Impacts

The Proposed Action would result in some increased soil loss and sedimentation from water and wind erosion. Productivity of some disturbed soils would be reduced due to the removal of vegetation, compaction, and exposure of the soils, mixing of soil horizons, and increased susceptibility to wind and water erosion.

4.2.4.5 Cumulative Impacts

Soil resources within the CIAA would continue to be impacted by ongoing oil and natural gas development, livestock grazing, and recreational use. Cumulative total disturbance in the CIAA would total 3,883 acres, and cumulative LOP disturbance would total 1,410 acres, including proposed

disturbance from the CGIDP. However, once natural gas facilities have been abandoned and reclaimed, erosion rates would eventually return to pre-disturbance levels. Based on the actual, authorized, and proposed disturbance associated with natural gas development discussed above, total surface disturbance would total approximately 6% of the CIAA and LOP disturbance would total approximately 2%. The use of Best Management Practices (BMPs) to minimize soil erosion and promote reclamation would result in low cumulative impacts to soils.

Assuming that the wells are geographically distributed in approximately the same manner as the wells drilled under the Cave Gulch EIS, the approximate cumulative total disturbance and cumulative LOP disturbance that would occur in each watershed within the CIAA, as well as the percent of each watershed within the CIAA that would be disturbed for the LOP would be as follows: Alkali Creek - 168 acres total disturbance, 76 acres (1.7%) LOP disturbance; Poison Creek - 313 acres total disturbance, 95 acres (1.5%) LOP disturbance; North Branch Cave Gulch - 378 acres total disturbance, 166 acres (1.4%) LOP disturbance; Main Branch Cave Gulch - 789 acres total disturbance, 318 acres (7.4%) LOP disturbance; South Branch Cave Gulch - 340 acres total disturbance, 133 acres (1.6%) LOP disturbance; Waltman Draw - 791 acres total disturbance, 247 (5.9%) LOP disturbance; Sand Draw - 275 acres total disturbance, 95 acres (1.9%) LOP disturbance; Sand Draw Tributary - 162 acres total disturbance, 87 acres (3.0%) LOP disturbance; Keg Springs Draw - 281 acres total disturbance, 76 acres (1.2%) LOP ; and Sand Draw (in Modified Cooper Reservoir project area) - 407 acres total disturbance, 117 acres (1.4%) LOP disturbance.

The Cave Gulch EIS established the following significance criterion: “The proposed project would increase the total cumulative soil disturbance within the project area to more than a total of 10 percent of a given watershed intersected by the project area.” Pages 5 through 8 of the Cave Gulch EIS explains the 10% threshold is important because at that level of disturbance watersheds begin to show obvious adverse signs of instability and adjustment (i.e., excessive erosion, slope stability, channel instability, and sedimentation). The 10% disturbance threshold is supported by research in humid regions that indicates that urbanization producing more than 10% effective impervious areas in a watershed will lead to degradation of the stream channel (Booth 2000). A threshold value for disturbance in any given watershed in a semi-arid region such as the Casper Field Office area has not been accurately determined. However, the 10% criterion would not be exceeded for LOP disturbance in any of the watersheds in either the CGIDP area of the CIAA.

Erosion conditions have been carefully documented through field inspections in the Cave Gulch EIS area. “Obvious adverse signs of instability and adjustment” have not been observed. Field-wide inspections conducted by BLM in the fall of 2003 noted generally stable soil conditions.

4.2.5 Water Resources

The Cave Gulch EIS concluded that most adverse impacts to water resources could be avoided or reduced by implementation of mitigation presented in that document.

4.2.5.1 Proposed Action

Potential impacts to surface water resources from the Proposed Action include increased turbidity, salinity, and sedimentation due to increase runoff and erosion from 766 acres of disturbance or from accidental spills of petroleum products or other pollutants. Erosion would increase above current rates until all disturbed areas are successfully revegetated. The potential for erosion and stream sedimentation would be minimized by implementation of applicant-committed environmental protection measures, including proper facility siting to avoid riparian areas, use of BMPs, and prompt implementation of reclamation. Areas disturbed by development authorized in the Cave Gulch ROD were monitored in 1998, 2000, and 2003, and it was determined that 13 of the 15 evaluated sites met erosion control objectives and required only minor maintenance, whereas two sites required major remediation efforts (BLM 2003).

Extensive mitigation measures included as applicant-committed environmental protection measures and Appendix A of this EA would be implemented by the Operators to minimize impacts to water resources, as would measures contained in Appendix A of the Cave Gulch ROD, which are incorporated by reference into this EA. The Operators would not construct any well pads, access roads, or pipelines within 100 ft of any ephemeral or intermittent drainage channel except where pipeline or road crossings are required. The Operators would bury all pipelines below the maximum scour depth or a minimum of 4 ft below the bottom of all channel crossings and would reclaim any ephemeral or intermittent drainage channels that would be disturbed during construction. Produced water from the Proposed Action would be disposed of in accordance with existing, approved disposal methods within the CGIDP area, including surface discharge under pre-existing NPDES permits and via sub-surface injection in the existing water disposal wells. Four additional water disposal wells are proposed in conjunction with the Proposed Action. There would no adverse impacts to surface water resources resulting from produced water

discharges as the discharged water would be required to meet WDEQ water quality standards as specified in the approved NPDES permits. The Operators would minimize disturbance and would implement prompt reclamation in accordance with approved reclamation guidelines presented in Chapter 2 and Appendix A of this EA. Once reclamation has been successful, the rate of erosion and sedimentation would begin to approach pre-disturbance rates. Therefore, the Proposed Action would not result in any changes in water flow or water quality and would have negligible impacts on surface water resources.

Potential impacts to groundwater resources from the Proposed Action include water consumption during drilling, completion, testing, and production operations. Water required for the Proposed Action would be provided from existing wells as described in Section 2.2.6.1, and no adverse impacts to existing water rights would occur. During the exploration of development of each natural gas well, water and fluids used for drilling would be stored in reserve pits at each well location and all pits would be lined to reduce or limit any subsurface or groundwater contamination. Therefore, there would be a negligible impact to groundwater resources resulting from the use of lined, earthen reserve pits.

As discussed in Chapter 3 of this EA, there are no identified seeps or springs within the CGIDP area. However, to protect any previously unidentified seeps or springs, the Operators would evaluate potential drill sites during the APD process prior to constructing the well pad. As specified in the Cave Gulch EIS, the Operators would not construct any facilities within 200 to 600 ft of any seep or spring. The actual buffer distance would depend on the characteristics of the spring. Therefore, there would be negligible impacts to seeps and springs.

Other potential impacts to ground-water resources include cross-aquifer mixing through the well bore. These potential down-hole impacts would be minimized by the implementation of well drilling, casing, and cementing procedures conducted in accordance with *Onshore Oil and Gas Order No.2* (43 C.F.R. 3160). Therefore, the Proposed Action would have negligible impacts on groundwater resources due to cross-aquifer mixing.

Based on information presented in Section 3.3.5.3 of this EA, approximately 300 acres (0.1% of the CGIDP area) of potential wetlands and waters of the U.S. occur in the CGIDP area. As specified in the Proposed Action and Appendix A of the Cave Gulch ROD, the Operators would avoid, to the extent practicable, wetlands and other waters of the U.S. The Operators would coordinate with the COE to obtain proper authorization where avoidance would not occur. Therefore, the Proposed Action would have negligible impacts upon existing wetlands and waters of the U.S. The Operators would, however,

add a constructed wetland of approximately 0.34 acre as part of their water treatment and disposal facility that would be beneficial impact.

4.2.5.2 No Action Alternative

Under the No Action Alternative, the BLM would deny the Proposed Action, and no additional disturbance/development beyond that which has already been authorized by the BLM would occur. Impacts to water resources would continue at existing levels.

4.2.5.3 Mitigation and Monitoring

No additional mitigation or monitoring is recommended.

4.2.5.4 Residual Impacts

The Proposed Action would result in some small increase in turbidity, salinity, and sedimentation due to increased runoff and erosion from 766 acres of surface disturbance.

4.2.5.5 Cumulative Impacts

Surface water resources within the CIAA would continue to be impacted primarily by ongoing oil and natural gas development and livestock grazing, and the primary impact to surface water resources would be the introduction of soils eroded from disturbed lands. Cumulative total disturbance in the CIAA would total 3,883 acres, and cumulative LOP disturbance would total 1,410 acres. Based on the actual, authorized, and proposed disturbance associated with natural gas development, total surface disturbance would total approximately 6% of the CIAA and LOP disturbance would total approximately 2%. The use of BMPs to minimize soil erosion and promote reclamation would result in low cumulative impacts to water resources.

No serious ground-water pollution problems have been detected in the CIAA. Current oil and gas exploration and development activities must comply with federal and state environmental quality laws and, thus, serious water quality and quantity impacts are not expected on a cumulative scale. This is particularly true given Onshore Oil and Gas Order No. 2 and the recent BLM guidelines that direct well completion techniques that reduce the potential for ground-water contamination.

4.3 BIOLOGICAL RESOURCES

4.3.1 Vegetation (Including Invasive Non-native Species)

The Cave Gulch EIS concluded that “Impacts to vegetation include removal of cover types and the potential for noxious weed invasion. Except for waters of the U.S. (including wetlands) and special status plant species and their habitat, disturbance of vegetation cover types would not be important because upland types are common, have high frequencies of occurrence, cover large areas, and have wide distribution” and that “significant impacts to vegetation resources would not occur under the Proposed Action.”

4.3.1.1 Proposed Action

The primary impact of the Proposed Action would be the short-term loss of 766 acres of vegetation and vegetative production. Of this 766-acre loss, 510 acres would be returned to some level of vegetative production for livestock and wildlife grazing and wildlife habitat within 2 to 3 years following initial disturbance--possibly longer during periods of drought. These reclaimed areas would likely return to pre-disturbance levels of vegetative diversity and production within 20 to 30 years.

The disturbance of existing, native vegetation would create opportunities for the establishment of invasive non-native (invasive) species, a situation that has been observed during erosion and reclamation monitoring surveys in the Cave Gulch EIS project area. Invasive species (Russian thistle and halogeton) were the dominant species on 10 of 15 reclaimed well pads monitored by the BLM in 2003 (BLM 2003). Both Russian knapweed and cheatgrass also were found on many of the sites. Drought conditions over the past several years have contributed to the proliferation of these invasive species on recently reclaimed areas.

Invasive species are easily established and commonly found on all newly disturbed and reclaimed sites throughout Wyoming. These species are fast growing and can out-compete native species, increase the danger of wildfires, and prevent/deter the establishment of native species including grasses, forbs, and shrubs. However, assuming that permanent vegetation (those native species that were intentionally seeded) would eventually become established on these reclaimed sites, invasive species can, in the interim, reduce soil erosion by holding the soil, breaking the impact of direct precipitation on the soil

surface, and altering the microclimate of the soil by reducing soil temperatures, reducing wind speeds, collecting snow fall, and reducing soil moisture evaporation.

The Operators would continue to implement the invasive species control measures that were included in Appendix A of the Cave Gulch ROD. In addition, the Operators would conduct a weed control program over the next several years on problem areas where invasive species have become established. An aggressive weed control program coupled with prompt implementation of temporary and permanent reclamation measures would reduce the vegetative impacts to a low level.

4.3.1.2 No Action Alternative

Under the No Action Alternative, the BLM would deny the Proposed Action, and no additional disturbance/development would occur beyond that already authorized. Impacts to vegetation, including invasive nonnative species, would continue at current levels.

4.3.1.3 Mitigation and Monitoring

No additional mitigation or monitoring is recommended.

4.3.1.4 Residual Impacts

The Proposed Action would result in the disturbance/removal of vegetation from 766 acres within the CGIDP area, including 256 acres of LOP disturbance. It could take 20 to 30 years after reclamation has been initiated for some reclaimed areas to achieve vegetation production and species diversity comparable to pre-disturbance conditions.

4.3.1.5 Cumulative Impacts

Vegetation in the CIAA would continue to be impacted primarily by ongoing oil and natural gas development and livestock grazing. Cumulative total disturbance in the CIAA would total 3,883 acres and cumulative LOP disturbance would total 1,410 acres. Based on the actual, authorized, and proposed disturbance associated with natural gas development total surface disturbance would total approximately 6% of the CIAA and LOP disturbance would total approximately 2%. The use of BMPs and adherence to

the reclamation plan in Appendix A would result in low cumulative impacts to vegetation. No special habitats would be disturbed, and invasive species would be controlled by the Operators as necessary.

4.3.2 Wildlife Resources

The Cave Gulch EIS concluded that “The application of prescribed avoidance and mitigation measures as well as additional measures...would reduce the impact potential and allow for any of the action alternatives to be performed without significant impacts to wildlife.”

4.3.2.1 Proposed Action

Impacts to wildlife could result from loss of habitat due to vegetation removal; displacement due to disturbance by project-related activities; mortality due to construction-related activities; increased mortality due to poaching and harassment; and an increased likelihood of vehicle/animal collisions due to increased traffic within the CGIDP area.

The temporary loss of 766 acres of big game habitat due to vegetation removal would be mitigated with measures included in the Proposed Action to minimize surface disturbance and to ensure timely reclamation and revegetation of all disturbed areas.

Big Game. As indicated in Section 3.4.2.1, the CGIDP area includes both yearlong and winter/yearlong habitat for both pronghorn antelope (*Antilocapra americana*) and mule deer (*Odocoileus hemionus*); however, no crucial habitats are known to exist for either species within the CGIDP area. Rather than direct habitat loss, the greatest impact on big game species would result from displacement of individual animals from preferred habitats as a result of increased levels of human activity (including vehicular traffic) and associated noise. The extent of this displacement is difficult to predict when one considers that response to noise and human presence varies from species to species, as well as among individuals of the same species. Some unquantifiable amount of displacement of pronghorns from areas adjacent to disturbance, such as construction and drilling operations, would reduce pronghorn use of additional habitat during the time the disturbance continued. Displacement likely would be about 0.5 mi (Gusey 1986; Guenzel 1987; Easterly et al. 1991). Once the disturbance ended, however, pronghorn likely would again utilize the habitat during production operations, although probably not to the same extent as prior to disturbance. Although methodologies for documenting animal displacement or changes in distribution are fairly straightforward, those for documenting population-level impacts (survival, reproduction) are

extremely complex. Therefore, little information is available concerning how human-related disturbances impact reproduction and survival of ungulates (Western EcoSystems Technology, Inc. [WEST] 2003).

Reeve (1984) reported that pronghorn habituated to increased traffic volumes and heavy machinery as long as traffic moved in a predictable manner. Reaction of pronghorns to roads is not well understood; however, Wyoming drivers often see pronghorns adjacent to road ROWs, including even busy interstate highways. It is likely that pronghorn movement is more affected by fences along ROWs than by the activity (traffic) on the ROW. At the same time, the difficulty that pronghorns have crossing fences adjacent to highway ROWs likely reduces the chance of vehicle/pronghorn collisions.

Easterly et al. (1991) reported that mule deer frequented areas near and in oil fields in the Rattlesnake Hills in Wyoming, and Reed (1981) reported that mule deer continued to occupy areas of the Belle Ayre coal mine in northeastern Wyoming during mining activity. Reeve (1996) reported no difference in the distance of mule deer observations and random points from roads and producing wells and concluded that mule deer were able to tolerate roads and wells associated with normal well field activities; however, West (2003) believed that the methods used to collect the data were biased and the data presented in the report do not support the conclusions. Lutz et al. (2003) reported that “Research addressing specific impacts of mineral exploration and development is scant. As a result, evaluations of potential impacts of such activities are often based on inferences made on observed effects by other similar actions,” and “Depending on time of year and availability of cover, mule deer avoided zones approximately 100-400 m (328-1,312 ft) from roads or human presence (Ward et al. 1980), changed behavioral patterns and habitat use patterns when harassed (Yarmonoy et al. 1988), and escaped from snowmobiles or humans walking, more so when disturbed repeatedly (Freddy et al. 1986).”

Some unquantifiable amount of displacement of mule deer from areas adjacent to disturbance, such as construction and drilling operations, would reduce deer use of additional habitat during the time the disturbance occurred. Once the disturbance ended, however, mule deer likely would utilize the habitat during production operations; however, there would be some loss of habitat effectiveness because habitat utilization would not be as high as prior to disturbance.

In addition to the avoidance response, an increased human presence intensifies the potential for wildlife-human interactions ranging from the harassment of wildlife to poaching and increased legal harvest. Likewise, increased traffic levels on existing access roads could increase the potential for wildlife-vehicle

collisions. These collisions are most frequent where roads traverse areas commonly frequented by game species.

Generally speaking, construction, drilling, and completion activities outside of the core area would temporarily displace big game animals in the immediate vicinity (up to 0.5 mi) of such activities. However, once such activities are completed, most big game animals would acclimate to some degree to the reduction in traffic and human activity and would utilize suitable habitat in closer proximity to well pads, access roads, and pipelines; however, such habitat likely would not be utilized to the same extent as it was prior to disturbance.

It could take from 10 to 20 years for some reclaimed areas to attain pre-disturbance shrub conditions and vegetation diversity. However, once all production operations have been completed, facilities abandoned, and re-vegetation operations are completed and suitable vegetation habitat re-established, big game would likely re-occupy all previously disturbed areas within the CGIDP area.

On the other hand, the intensive exploration and development activities proposed within the core area of the CGIDP area (including an approximately 0.5-mi buffer zone surrounding the core area) would likely render this area as ineffective for big game habitat for the LOP. However, final abandonment and reclamation of the facilities in the area, coupled with a cessation of human activity, would allow big game animals to re-occupy these areas. Considering the level of activity that has previously occurred within the core area, it is likely that displacement of big game species from that area has already occurred.

For the above-stated reasons, impacts to big game animals would be low.

Small Mammals. Impacts to small mammals resulting from implementation of the Proposed Action would include direct mortality during project-related activities, especially associated with construction activities and increased traffic. Generally, the dispersed and relatively small amount of habitat physically impacted by well pads, access roads, and pipeline ROWs outside of the core area would limit impacts to small mammal species. Many small mammal species are relatively tolerant of human activity and would likely experience population reductions in direct proportion to the amount of habitat removed. This would most likely be true for species with relatively small home ranges (rodents and lagomorphs) and less applicable to more wide-ranging species such as coyotes. Project-related impacts to small mammals would likely be masked by natural variations in weather, disease, and other natural factors. Impacts to rare habitats (wetlands areas) would be minimal. The loss of habitat for other mammals due to vegetation

removal would be mitigated with measures included in the Proposed Action to minimize surface disturbance and to ensure timely reclamation and revegetation of all disturbed areas.

Impacts to small mammal populations in the core area of the CGIDP area would be greater than in other portions of the CGIDP area because of the intensive activity associated with increased well densities.

Raptors. Minimal raptor nesting activity has occurred within the original Cave Gulch EIS area since the Cave Gulch ROD was issued in 1997, with one to three active nests observed in years when surveys were conducted (Table 4.10). Comprehensive inventories conducted in 2003 and 2004 failed to identify any *Buteo* (ferruginous, red-tailed hawk, or Swainson's hawk) nesting activity within the Cave Gulch EIS area. Successful golden eagle nesting activity did occur within the Cave Gulch EIS area at one nest located about 1.5 mi southeast of those areas that have experienced continuous oil/gas development. The buffer area for avoidance of active raptor nests by CGIDP-related activities is 0.5 mi--an increase over the 0.25 mi avoidance area prescribed the Cave Gulch EIS.

Table 4.10 Occupied Raptor Nests in the Cave Gulch EIS Project Area Since 1997.

Year	Occupied Nests		General Comments ²
	No. of Nests	Nest No. ¹	
1997	3	20c, 193	FEHA, GHOW, and RTHA nests. GHOW and RTHA nests were within 0.5 mile of development, but were not in line-of-sight. FEHA nest was > 1.5 miles east of development.
1998	3		FEHA, GHOW, and SWHA nests. None of the 3 nests were within 1 mile of development activity.
1999	1	2466 ³	SWHA nest was south of Hwy 20/26, > 1 mile away from development activities.
2000	2	5, 20c	GOEA and GHOW nests. GOEA nest was > 1.5 miles southeast of development activities. GHOW nest was within 0.5 mile of development, but was not in line-of-sight.
2001	0	--	No known nesting activity.
2002	0	--	No known nesting activity.
2003	0	--	No known nesting activity.
2004	1	5	GOEA nest was > 1.5 miles southeast of development activities.

¹ Nest numbers from *Raptor Technical Report for the Cave Gulch Analysis Area 1994, 1995, 1996*. Hayden-Wing Associates. February 1997.

² GHOW = Great horned owl
RTHA = Red-tailed hawk
SWHA = Swainson's hawk
FEHA = Ferruginous hawk
GOEA = Golden eagle

³ Nest identified by WGFD in 1999. Apparently a new nest that was not present during the Hayden-Wing inventories conducted prior to 1999.

The Cave Gulch EIS predicted that an estimated three to seven raptor nesting territories would be impacted over the short-term by project-related activities associated with the Cave Gulch EIS, with the number of territories impacted based upon the availability of prey species in any given year. The Cave Gulch EIS also predicted that impacted areas would be re-colonized as intensive development gave way to less intensive operations such as routine production and well maintenance. Based on monitoring data collected to date, *Buteo* sp. nesting activity has been completely displaced from the Cave Gulch EIS area, and golden eagle nesting activity has occurred only in an area more than 1.0 mi from development activities. This displacement is expected to continue, particularly in the core area of the CGIDP--until such time as intensive oilfield activities within the area have ceased. Whether or not these displaced raptors have established new territories as a result of ANSs installed subsequent to the issuance of the Cave Gulch ROD is not known. However, it is true that successful nesting activity has increased at these ANSs sites (two installed within the GRAA and 12 installed outside the GRAA) from one pair in 1998 to five pairs in 2004. Considering that intensive exploration and development activities are predicted for an additional 5 to 10 years within the CGIDP area, with production expected to last for approximately 40 years, these ANSs will continue to play an important role in promoting successful raptor nesting activity in this area of Natrona County.

As stated in the Cave Gulch EIS, some re-colonization would be expected once intensive operations associated with continued oil/gas exploration and development end. Considering that most potential impacts to raptor nesting activity within the CGIDP area have already occurred, implementation of the Proposed Action would not be expected to have additional adverse impacts on raptor nesting activity within the CGIDP area. To ensure continued nesting success, the 14 existing ANSs will be protected as outlined in the Cave Gulch ROD, including a 0.25-mi no surface occupancy (NSO) radius around each ANS.

Upland Game Birds and Other Migratory Birds. Three of the species identified in Table 3.5, including ferruginous hawk, greater sage-grouse, and mountain plover (BLM-sensitive species) are discussed below.

Surface-disturbing activities associated with the Proposed Action would result in the short-term disturbance of 766 acres of shrub-steppe and shortgrass prairie habitat, which would provide a source of food, security cover, and nesting habitat for many of the species listed in Table 3.3. Approximately 67% of this disturbance would be reclaimed within 5 years of initial disturbance, leaving a LOP loss of 256 acres of habitat. Reclamation of those non-working areas disturbed in conjunction with

additional exploration and development activities within the CGIDP area would introduce some degree of vegetative (habitat) diversity into the area which would benefit those species dependant upon the shortgrass prairie habitat type.

Considering the relatively small amount of surface disturbance proposed within the 27,013-acre CGIDP area, the actual magnitude of direct habitat loss and subsequent displacement would be negligible. Impacts would occur in direct proportion to the amount of a species' habitat that would be directly disturbed or rendered less habitable by adjacent human activity and the time of year the disturbance occurred. Some increased mortality would be likely from bird/vehicle collisions as a result of increased vehicle traffic and from collisions with structures. Impacts to waterfowl and shorebirds would be minimal because few areas of suitable habitat would be affected. Depending upon the time of year, birds could move to adjacent habitats undisturbed by project-related activities. However, project-related activities during the nesting season could result in nest failure or destruction. Such impacts, however, would be of such scale that they would be unlikely to affect area populations. Any power lines would be designed, constructed, operated, and maintained in conformance with the *National Electrical Safety Code* and other applicable codes and standards, as well as *Suggested Practices for Raptor Protection on Powerlines: The State of the Art in 1996* (Avian Power Line Interaction Committee 1996). Implementation of these standards would reduce the risk of bird electrocutions.

Amphibians, Reptiles, and Fish. Potential adverse impacts to amphibians or reptiles include direct mortality during surface-disturbing activities, loss of suitable habitat, and displacement of individuals. Such impacts would occur in direct proportion to the amount of suitable habitat disturbed. Mitigation described in the Proposed Action to minimize surface disturbance, to ensure timely reclamation, and to avoid wetlands would minimize project-related impacts to amphibians and reptiles to negligible levels.

4.3.2.2 No Action Alternative

Under the No Action Alternative, the BLM would deny the Proposed Action, and no additional disturbance/development would occur beyond those levels previously authorized. Wildlife populations would continue at present levels, with fluctuations due primarily to weather, disease, and other natural causes.

4.3.2.3 Mitigation and Monitoring

Implementation of the following BMP developed by Wyoming PIF (Nicholoff 2003) would reduce the impacts of surface disturbing activities within the CGIDP area on both migratory and non-migratory bird species.

- Relocate surface-disturbing activities to avoid large sagebrush stands to the greatest extent possible in order to prevent habitat fragmentation within the shrub-steppe habitat type.
- Where possible, restore or rehabilitate degraded and disturbed sites to native plant communities.
- In large disturbed areas, sagebrush and perennial grasses may need to be reseeded to shorten the recovery time and prevent dominance by non-native grasses and forbs.

4.3.2.4 Residual Impacts

The Proposed Action would result in the disturbance of approximately 766 acres of wildlife habitat. Some species such as big game, large mammals, upland game birds, and raptors would be temporarily displaced and some wildlife species, especially small mammals, small birds, amphibians, and reptiles would be killed during construction activities. There would also be an indeterminate increase in wildlife mortality from vehicle/animal collisions.

4.3.2.5 Cumulative Impacts

Cumulative impacts to wildlife resources would likely occur in direct proportion to the amount of habitat loss that occurs for each species. Cumulative total disturbance in the CIAA would be 3,883 acres (6% of the CIAA), and cumulative LOP disturbance would total 1,410 acres (2% of the CIAA). All but LOP disturbance would be reclaimed shortly after it occurred and would generally take 3 to 20 years to reach pre-disturbance conditions. Once natural gas facilities have been abandoned and reclaimed, all disturbed areas would eventually return to pre-disturbance conditions. No special habitats would be disturbed. There is no evidence that there are or have been any significant cumulative impacts to any wildlife species within the CIAA.

The CIAAs for pronghorn and mule deer are the respective herd units. Considering the level of activity that has previously occurred within the Cave Gulch EIS area, it is likely that displacement of big game

species from the affected area has, to a large degree, already occurred. No crucial habitats for either species would be disturbed. As a consequence, the loss of 766 acres of habitat (<0.02% of both the pronghorn and mule deer herd units) would be a negligible cumulative impact.

The CIAA for small mammals, upland game birds, migratory birds, reptiles, amphibians, and fish is the CGIDP area; therefore, cumulative impacts would be added to impacts resulting from actions described in the Cave Gulch EIS. Impacts to all of these animals would be negligible to low and would decrease as initial disturbance is reclaimed. The CIAA for raptors is the GRAA. As shown in Table 4.9, raptor nesting activity in the Cave Gulch EIS area has declined since the issuance of the Cave Gulch ROD. Inventories of raptor nesting activity in the GRAA conducted by private consultants via helicopter in 1996, 1997, and 1998 identified 18, 20, and 19 active nests, respectively--which would seem to indicate a relatively steady number of nesting pairs within the GRAA. However, the inventory conducted via fixed-wing aircraft in 1999 by the WGFD identified seven active nests within the GRAA. Whereas this would appear to be a substantial decrease in nesting pairs within the GRAA for the 1999 nesting season, a significant difference in the 1999 inventory methodology (fixed-wing aircraft versus helicopter) may well account for this apparent reduction in nesting pairs. As indicated in Section 3.4.2.3, operator-funded monitoring inventories within the GRRA were scheduled to cease after 1998. Because no intensive raptor nesting inventories have been conducted within the GRAA using a similar methodology since 1998, it is not possible to quantify nesting activity in this area in subsequent years. Although there has been an increasing use of the ANSs installed east/northeast of the Cave Gulch EIS area, cumulative impacts on raptor nesting and overall raptor populations in the CIAA are unknown subsequent to 1998.

4.3.3 Threatened, Endangered, Proposed, and Candidate Species and BLM-Sensitive Species

The Cave Gulch EIS concluded that there would be no impacts to black-footed ferret or mountain plover, and that mitigation measures were adequate to avoid adverse impacts to swift fox should they be determined to occur on the project area. Bald eagle and Ute ladies'-tresses were not discussed in the Cave Gulch EIS. Impacts to greater sage-grouse were predicted to be negligible. Other sensitive species would be impacted by destruction of habitat, displacement, and collisions with vehicles.

4.3.3.1 Proposed Action

Bald Eagle. The CGIDP area does not contain suitable roosting/perching habitat, concentrated feeding areas (perennial streams), or other special (nesting) habitats which might result in increased eagle activity

therein. Migrating or foraging bald eagles and those nesting or wintering along the North Platte River may occasionally forage or fly through the CGIDP area; however, such use is likely intermittent and for relatively short periods of time. Moreover, the level of human activity expected to occur within the project area would likely discourage eagle use. Consequently, any potentially significant impacts would not be expected to occur to bald eagle populations as a result of activities associated with the CGIDP. To minimize potential impacts to all raptors (including bald eagle), any project-related power lines would be designed and constructed in accordance with *Suggested Practices for Raptor Protection on Powerlines: The State of the Art in 1996* (Avian Power Line Interaction Committee 1996). Given the intermittent use and the lack of nesting and roosting habitat in the CGIDP area and the power line mitigation measures described above, it is anticipated that the Proposed Action will have no effect on bald eagles. Bald eagle use of this area is infrequent for the reasons stated above.

BLM-Sensitive Animal and Plant Species. Impacts to most BLM-sensitive species as a result of the Proposed Action likely would occur in direct proportion to the amount of their habitat that would be disturbed. The Proposed Action would result in approximately 766 acres of disturbance (256 acres of LOP disturbance), or approximately 3% of the CGIDP area. Most species are sufficiently mobile that, if present, they would not be affected by the Proposed Action. However, some individuals would be killed by vehicles or equipment, or temporarily or permanently displaced from their preferred habitats. Such impacts would be limited to a relatively few individuals and would not have an adverse affect on populations as a whole. As specified in the Cave Gulch ROD, the Operators would comply with seasonal nesting restrictions for raptors (but would increase the buffer area for active nests from 0.25 mi to 0.5 mi), and any project-related power lines would be designed and constructed in accordance with *Suggested Practices for Raptor Protection on Powerlines: The State of the Art in 1996* (Avian Power Line Interaction Committee 1996).

As indicated in Section 3.4.3.3, successful mountain plover nesting was documented in Section 27, T36N, R87W, in 2004. In addition, suitable habitat is known to exist within the CGIDP area--particularly in the 1,920-acre addition to the original Cave Gulch EIS project area, as well as the extreme northeastern corner of the CGIDP area (Ralston Flats area northeast of the BNSF railroad ROW). The Operators would assess potential impacts on mountain plovers in these areas on a well-by-well basis. If construction-related activities in potential mountain plover nesting habitat would occur between March 15 and July 10, surveys for the presence of nesting mountain plovers would be conducted in accordance with current survey protocol, and appropriate mitigation measures (seasonal avoidance) would be implemented as directed by the BLM.

The greater sage-grouse leks identified in Section 3.4.3.3 are all located more than 3 mi from the exterior boundary of the CGIDP. The closest known lek to the project area is Notches 3, which is located approximately 3.25 mi from the northeast corner of the CDIGP area and over 5 mi from the “core” area of the CGIDP. While greater sage-grouse nesting and early brood-rearing habitat does exist within selected portions of the CGIDP area as discussed in Section 3.4.3.3, the extent to which these habitats are currently being utilized by grouse for nesting (or other purposes) is unknown. However, considering that no greater sage-grouse leks or other important habitats have been documented within 3 mi of the CGIDP area, it is unlikely that the Proposed Action would adversely affect greater sage-grouse populations within the area of impact. Some individual greater sage-grouse could be killed as a result of vehicle/bird collisions; however, such collisions would be uncommon and would likely have negligible impacts on greater sage-grouse populations in the overall area. BLM would assess greater sage-grouse nesting and early brood-rearing habitat suitability in conjunction with the on-site inspection on a well-by-well basis as drilling proposals are submitted by the Operators. In those instances where suitable nesting and early brood-rearing habitat was identified, mitigation measures would be recommended in accordance with current BLM policy.

In summary, the Proposed Action would have negligible impacts on TEPC species and BLM-sensitive species and would not contribute to the need to list any species under the provisions of the *Endangered Species Act*.

4.3.3.2 No Action Alternative

Under the No Action Alternative, the BLM would not approve the Proposed Action, and no additional disturbance/development would occur beyond that already authorized. Impacts to TEPC species and BLM-sensitive species would continue at current levels, with fluctuations due primarily to weather, disease, and other natural causes.

4.3.3.3 Mitigation and Monitoring

The operators would comply with current BLM policy regarding greater sage-grouse management.

4.3.3.4 Residual Impacts

Under the Proposed Action, there could be some displacement of both TEPC and BLM-sensitive species. There would also be a slight risk of electrocution of raptor species should power lines be constructed and operated, although the risk would be mitigated by the utilization of a raptor-safe power line structure design. Some individuals of BLM-sensitive species may be adversely affected (greater sage-grouse collisions with vehicles) by the Proposed Action.

4.3.3.5 Cumulative Impacts

Cumulative impacts to TEPC and BLM-sensitive species would likely occur in direct proportion to the amount of disturbance to habitats of the specific species. Cumulative total disturbance in the CIAA would be 3,883 acres and LOP disturbance would total 1,410 acres. Potential impacts to TEPC species would be minimized by conducting species-specific surveys and the implementation of species-specific mitigation measures if the species occurs in an area to be affected by project-related activities. Impacts to BLM-sensitive species would be limited to areas where suitable habitat would be removed or the larger area from which individuals may be displaced by project-related activities. There is no evidence that there are or have been any significant cumulative impacts to any TEPC or BLM-sensitive species within the CIAA.

4.4 HUMAN RESOURCES

4.4.1 Cultural Resources

The Cave Gulch EIS stated that “Although the project area has a high degree of archaeological sensitivity, impacts to known cultural properties would not be significant. Potential impacts to known and anticipated cultural resources can be alleviated through appropriate mitigation measures.”

4.4.1.1 Proposed Action

As reported in Section 3.2 of this EA, Wyoming SHPO records indicate that numerous areas have been inventoried for cultural resources within the CGIDP area, and most of these inventories have been conducted in association with recent oil and gas development. Potential direct impacts to sites considered eligible to the NRHP would result primarily from construction-related activities on approximately

766 acres. Activities considered to have the greatest impacts on cultural resources include the construction of well pads, roads, and pipelines.

Indirect impacts to prehistoric sites include unauthorized surface collecting of artifacts and casual use activities that could physically alter a site. Indirect impacts could also result from the alteration of the surrounding environment by introducing visual changes into the viewshed, especially for historic sites such as the Bridger Trail, the abandoned Chicago & Northwest Railroad Grade, and the National Park-to-Park Highway/Yellowstone Highway.

Under the Proposed Action, the Operators would conduct a Class III cultural resource inventory of areas proposed for disturbance that have not previously been inventoried, including impacts to viewsheds of linear historic properties. These inventories would be conducted prior to BLM approval of individual actions associated with the Proposed Action and would recommend mitigation measures as necessary for the protection of those cultural resources identified on lands subject to federal jurisdiction. Cultural resources considered eligible for the NRHP would be avoided or mitigated prior to disturbance. If necessary, treatment plans or data recovery efforts would be conducted by authorized cultural resource personnel and the results approved by the BLM archaeologist and the SHPO. If a proposed well would physically disturb the Bridger Trail, the Chicago & Northwest Railroad Grade, or the National Park-to-Park Highway/Yellowstone Highway, the historic site would be evaluated and appropriate mitigation included in the APD.

The Operators would inform all field personnel not to search for, scavenge, or remove any cultural resources. Employees would be informed that they may be subject to federal prosecution for knowingly damaging, altering, excavating, or removing any archeological or historic objects or sites located on federal lands. If any previously unidentified archeological or historical materials are discovered, the Operators would suspend all operations that would further disturb such materials and immediately contact the BLM. Operations would not resume until a written authorization to proceed is issued by the BLM. Therefore, both documented and undocumented cultural resources would be protected from unauthorized disturbance and no unmitigated cultural resources that are considered eligible for the NRHP would be impacted by the Proposed Action.

4.4.1.2 No Action Alternative

Under the No Action Alternative, no additional disturbance/development would occur beyond that already approved by the BLM, and there would be no additional impacts to cultural resources.

4.4.1.3 Mitigation and Monitoring

No additional mitigation or monitoring is recommended.

4.4.1.4 Residual Impacts

Neither the Proposed Action nor the No Action Alternative would result in any residual impacts to identified cultural resources. However, some loss of undiscovered cultural resources or artifacts could occur.

4.4.1.5 Cumulative Impacts

Class III cultural resource surveys would be required on all lands subject to federal jurisdiction disturbed within the CIAA and would add to our knowledge of the history of the area. Sites would be avoided if practicable or, if not avoided, mitigated in accordance with BLM/SHPO recommendations. Some buried sites could be damaged, and vandalism may occur by the public. Cultural resources could be disturbed/destroyed by actions not requiring a federal permit. However, overall cumulative impacts to cultural resources are expected to be minimal.

4.4.2 Native American Religious Concerns

4.4.2.1 Proposed Action

No sites of religious concern to Native Americans are known to occur within the CGIDP area. If such sites are identified at a later date, their presence would be taken into consideration by the BLM and addressed in accordance with applicable rules, regulations, and policies.

4.4.2.2 No Action Alternative

Under the No Action Alternative, the BLM would deny the Proposed Action, and no additional disturbance/development beyond that already approved would occur. There would be no impacts to Native American religious sites.

4.4.2.3 Mitigation and Monitoring

No additional mitigation is recommended.

4.4.2.4 Residual Impacts

No residual impacts to Native American religious sites are anticipated.

4.4.2.5 Cumulative Impacts

Cumulative impacts to Native American religious sites would not be likely to occur because no sites of religious concern to Native Americans are known to occur within the CIAA. If such sites are identified at a later date, their presence would be taken into consideration by the BLM and addressed in accordance with applicable rules, regulations, and policies.

4.4.3 Land Use

The Cave Gulch EIS concluded that there would be no significant impacts to range resources from the authorized development. However, the document concluded that impacts would be significant to recreation because activities would be displaced for more than one season of use and because increased evidence of human activity would reduce recreationists' perceived levels of isolation and solitude.

4.4.3.1 Proposed Action

Under the Proposed Action, surface ownership and mineral ownership within the CGIDP area would not change. Other current land uses (livestock grazing, and dispersed recreation) could continue at reduced rates. The 766 acres that would be disturbed by the construction of the well pads, roads, and pipelines would be unavailable for livestock grazing and would also be lost to dispersed recreational use (to the

extent that dispersed recreation was previously available on those non-federal lands included within the CGIDP area). Approximately 256 acres would be unavailable for the LOP, and 510 acres would be unavailable for 3 to 5 years. However, once natural gas production operations have been completed, facilities removed, and the disturbed areas reclaimed, previous land uses would be available. Project-related activities would have a low to moderate impact on land use outside of the core area because of the dispersed nature of the disturbance, the limited amount of disturbance that would occur annually (70 to 140 acres), and the existing level of oil and gas development that has already occurred thereon.

The primary impact of the Proposed Action to livestock grazing within the overall CGIDP area would be the initial loss of vegetation and vegetative production resulting from 766 acres of short- and long-term disturbance. Assuming an average stocking rate of 10 acres per AUM and project-related disturbance only within public grazing allotments, the Proposed Action would result in a temporary reduction of 77 AUMs from public grazing allotments (51 AUMs due to short-term disturbance and 26 AUMs due to LOP disturbance). The 510 acres (51 AUMs) of short-term disturbance would return to some level of forage production for livestock grazing within 2 to 3 years and would likely return to pre-disturbance levels of forage production in 20 to 30 years. Some negligible to low level of disturbance to livestock management would also occur, and the potential for livestock/vehicle collisions would increase slightly.

The 256 acres (26 AUMs) of LOP disturbance would be unavailable for livestock grazing for 30 to 40 years until natural gas production operations are completed, facilities have been abandoned, and all remaining disturbance has been reclaimed. Once reclamation is completed, forage production would return and allow some level of livestock grazing within 2 to 3 years and livestock grazing would likely return to pre-disturbance levels in 20 to 30 years. Actual AUM adjustments, if necessary, would be made on an allotment basis and a separated decision regarding that matter will be issued. Overall, impacts to livestock grazing outside of the core area would be low.

Project-related activities within the core area would result in a proportionately higher loss of vegetation (and concomitant AUMs) as compared to the overall CGIDP area. The proportionately higher loss of AUMs in the core area would serve to further reduce livestock grazing opportunities therein due to the degree of surface disturbance and human activity associated with increased well densities. Conflicts between livestock operations and oil/gas exploration and development activity within the core area may increase to the point where grazing is no longer practical in this area for the LOP. These conflicts would include not only overgrazing of newly reseeded areas resulting in reclamation failure and the potential for

increased erosion and sedimentation but also an increased potential for livestock mortality due to collisions with oil-field-related traffic.

Under the Proposed Action, recreational resources/opportunities (hunting and scenic touring) within the CGIDP area would continue at their current levels. Whether the Cave Gulch EIS was correct in assessing significant impacts to recreation or not, the CGIDP would result in a continuation of the disturbance that resulted from the Cave Gulch EIS project; however, it would not increase impacts above current levels, but rather it would extend the time during which these impacts would occur. Access across and through the CGIDP area on public roads (U.S. Highway 20-26 and County Roads 104 and 212) would not be affected by the Proposed Action, and access to public lands within the CGIDP area would not be restricted or prohibited above or beyond pre-existing levels. The public would continue to be allowed to utilize public lands for these activities. In fact, access to public lands would be easier because of the construction of additional resource roads on public lands. Access to private property would not change, and the public would still be required to obtain landowner approval prior to accessing privately owned lands for hunting or scenic touring. Opportunities for upland game bird and small game hunting would be affected by project-related activities, and such activity could temporarily displace mule deer and pronghorn from lands outside of the core area.

Access to the southern Big Horn Mountains via the Byway would not be restricted. Some portions of the landscape along the Byway have already been affected by previous oil and gas exploration and development activity associated with the Cave Gulch EIS. These existing facilities are visible from a foreground perspective to the casual observer as they drive north from Waltman on County Road 104. While the Proposed Action would add to the existing visual intrusion of development along the 7.75 mi portion of County Road 104 within the CGIDP area, and could detract from the quality of the experience of some individuals traveling that portion of the Byway, the additional visual intrusion associated with the Proposed Action would not dramatically alter the existing viewer perspective. Impacts would be mitigated by prompt reclamation procedures and the Operators' continued implementation of other mitigation specified in Appendix A of this EA.

4.4.3.2 No Action Alternative

Under the No Action Alternative, the BLM would deny the current Proposed Action, and there would be no additional impacts to land use beyond those already authorized or that already exist. Impacts to livestock grazing would continue to occur at current low rates. Impacts to recreational resources would

continue to be affected by existing human development in the CGIDP area, including oil and gas development.

4.4.3.3 Mitigation and Monitoring

No additional mitigation or monitoring is recommended.

4.4.3.4 Residual Impacts

There would be both long- and short-term disruptions in current land use on the approximately 766 acres that would be disturbed during the construction of oil and gas infrastructure. This would include impacts to forage for, and displacement of both livestock and wildlife, and a reduction in recreational use. The Proposed Action would result in the short-term loss of 51 AUMs and the long-term loss of 26 AUMs from public grazing allotments. In addition, there would be a reduction in hunting opportunities and additional visual intrusions along a 7.75-mi portion of the Byway. These impacts would likely last for the LOP.

4.4.3.5 Cumulative Impacts

There would be no change in landownership in the CIAA. Land use would continue to be impacted by on-going oil and natural gas development, livestock grazing, and recreational use. Cumulative total disturbance in the CIAA would total 3,883 acres, and cumulative LOP disturbance would total 1,410 acres. Assuming an average of 10 acres/AUM, approximately 141 AUMs would be lost for the LOP in the CIAA. The CGIDP would add to disturbance that would further discourage recreation in the CIAA by extending the time over which oil and gas activity would occur. Other portions of the CIAA are not important for recreation, so cumulative impacts to recreation would be low to moderate.

4.4.4 Visual Resources

The Cave Gulch EIS concluded that neither the Proposed Action nor the alternatives would exceed the level of contrast allowed in a Class 4 zone. The only site specific exception would be the liquids recovery plant included in the Proposed Action and Alternatives A and B, which would produce significant visual impacts. The area of highest scenic quality within the project area would be seriously compromised by the Proposed Action and alternatives. Contrasts in line, form, color, and texture would dominate the

badland breaks. In addition the aesthetic experience of those traveling the Byway would be substantially diminished by the Proposed Action and alternatives. The first 9 mi of the Byway would no longer be an attractive southern gateway to the Bighorns. The Proposed Action and all alternatives would also diminish the recreation experience of those who may continue to recreate in the area.

4.4.4.1 Proposed Action

The Proposed Action would continue activity similar to that approved in the Cave Gulch ROD. Much of the proposed disturbance would occur in the core area of the CGIDP area not visible from any public roads. Most of the proposed exploration and development activity would occur in VRM Class IV and would be in compliance with that designation.

As indicated in Section 2.2.4, U.S. Highway 20-26 traverses the southern end of the CGIDP area, with the southern boundary of the CGIDP area (see Figure 1.1) located approximately 2 mi south of the highway. The CGIDP area extends north of U.S. Highway 20-26 for approximately 6 mi, and some exploration and development would likely occur in the 6-mi wide VRM Class III corridor along the highway (3 mi each side of the highway). The natural landscape in this 6-mi VRM Class III corridor has been subjected to extensive cultural modifications from both a foreground and middle ground perspective as described in Section 3.5.4. These existing facilities would tend to distract the viewer and combine to appreciably diminish the aesthetic experience of the viewshed in this particular area, thereby minimizing the impact of additional disturbances within the VRM Class III corridor attributable to the Proposed Action.

Short-term disturbances associated with development activities within the Class III VRM corridor along U.S. Highway 20-26 would clearly be evident and, depending upon the level of activity ultimately proposed within this corridor, may well dominate the viewshed in the short-term while drilling and completion operations are underway. Removal of drilling/completion rigs and successful reclamation of the disturbed areas within the corridor would serve to reduce the long-term visual impacts of existing wells but may not reduce the visual contrast (form and texture of the landscape) to a level that is subordinate to the visual strength of the existing, natural landscape. However, the existence of unrelated, strong visual intrusions within the VRM Class III corridor referenced above (junk yard at Waltman, man camp directly south of Waltman, overhead power lines, agricultural operations, etc.), when combined with the relatively short overall viewing period to motorists traveling east/west along the highway, would serve to minimize the visual intrusions resulting from activities proposed in conjunction with the proposed CGIDP. Moreover, mitigation measures, including those carried over from the Cave Gulch EIS,

would further minimize the visual impacts of additional oil/gas exploration and development activity to viewers in both the foreground and middle ground perspective along U.S. Highway 20-26.

4.4.4.2 No Action Alternative

Under the No Action Alternative, the BLM would deny the Proposed Action, and no additional disturbance/development beyond that already authorized would occur. Impacts to visual resources would occur as described in the Cave Gulch EIS.

4.4.4.3 Mitigation and Monitoring

No additional mitigation or monitoring is recommended.

4.4.4.4 Residual Impacts

The Proposed Action would result in temporary impacts to visual resources in the CGIDP area. However, these impacts would be mitigated to the extent practicable, and major portions of the proposed development would not be visible from any public road.

4.4.4.5 Cumulative Impacts

Visual impacts to the Cave Gulch EIS project area, the CGIDP, and the original and modified Cooper Reservoir project areas add to existing impacts that have substantially altered the viewsheds along U.S. Highway 20-26 and County Roads 104 and 212. Although the number of facilities within the viewshed would be increased, the cumulative impacts of these facilities on the landscape would remain consistent with VRM designations because of the implementation of mitigation contained in the Cave Gulch EIS and this EA.

4.4.5 Socioeconomics

The Cave Gulch EIS concluded that “Given the relatively few annual number of wells to be drilled under the Proposed Action, and the fact that anticipated drilling levels are well within the range of recent drilling levels in the area, the socioeconomic effects of the Proposed Action would be largely positive. The increases in income associated with the Proposed Action and alternatives A and B would be

substantial. The Proposed Action and Alternatives A and B would provide continued and increased employment opportunities for some local residents. Anticipated tax revenues associated with the Proposed Action would also be substantial. Local government service impacts would be limited to localized increased demand for road maintenance and law enforcement services. Negative impacts would not be significant according to the thresholds used for this analysis.”

4.4.5.1 Proposed Action

Under the Proposed Action, current levels of employment would continue; therefore, the impacts on the infrastructure of and social services in Natrona County would continue at existing levels. Many workers currently employed by the Operators have established residence in Natrona County. Any new workers employed by the Operators would likely replace existing workers, so there would be little change in the total number of employees. The Operators would continue to hire qualified contractors from Natrona County. Therefore, the Proposed Action would have negligible impacts on the infrastructure and social services of local, county, or state governments.

Various taxes generated by the purchase and use of equipment and supplies, as well as taxes and royalties generated by natural gas production, would augment revenues to all levels of government. The Proposed Action would generate substantial revenues to the City of Casper, Natrona County, the State of Wyoming, and the federal government. Projected tax revenues generated under the Proposed Action cannot be accurately estimated; however, they would likely be on the scale presented in Section 4.11.3.1 of the Cave Gulch EIS. On that assumption, total revenues generated over the LOP to all government entities would be \$200 to \$300 million.

4.4.5.2 No Action Alternative

Under the No Action Alternative, the BLM would deny the Proposed Action, and no additional development would occur beyond that already authorized. Impacts to socioeconomic resources would continue to occur at current rates until all the authorized wells were drilled, after which the economic benefits from construction, drilling, and completion would end. Economic benefits from oil and gas production would continue as long as the existing wells continued to produce. However, all revenues that would be generated under the Proposed Action (\$200 to \$300 million) would not be realized.

4.4.5.3 Mitigation and Monitoring

No additional mitigation or monitoring is recommended.

4.4.5.4 Residual Impacts

The Proposed Action would provide continued economic benefits to all levels of government.

4.4.5.5 Cumulative Impacts

Conventional natural gas development in the CIAA would add to the economic viability of Casper, Natrona County, the State of Wyoming, and the U.S. by providing revenue from job-creation, spending, taxes, and royalties, and would provide well-paying jobs in Natrona County. It would also improve economic stability for the various government entities for the LOP. The current infrastructure in Natrona County would be capable of accommodating any changes in needed social services. Therefore, the beneficial impact to socioeconomics would be moderate to high.

4.4.6 Health, Safety, and Transportation

The Cave Gulch EIS concluded that “Hazards associated with the drilling and development activities, including construction and operation are the ones normally associated with heavy construction and industrial work. There would be a minor increased risk to the public caused by project implementation resulting from additional drilling and production related traffic in the project area. None of these impacts occur at significant levels.”

4.4.6.1 Proposed Action

Impacts to health, safety, and transportation would be similar to those identified in the Cave Gulch EIS and would include activities related to occupational hazards associated with the oil and gas industry, risks associated with vehicle operation on improved and unimproved roads, potential vehicular collisions with big game or livestock, hunting-related and firearm-related accidents, and natural hazards such as flash floods and range fires. The volume of traffic and the risk of traffic accidents on U.S. Highway 20-26 and County Roads 104 and 212 is not expected to increase above current levels. The risk of these impacts/hazards would be no greater under the Proposed Action than under the Cave Gulch EIS project

because there would be no an increase in project-related personnel working in the area. The Operators anticipate that four drilling rigs would be active at any one time, and personnel currently working in the area would simply transition to new well sites and related activities.

4.4.6.2 No Action Alternative

Under the No Action Alternative, the BLM would deny the current Proposed Action, and no additional disturbance/development would occur beyond that already approved. There would be no additional impacts to health, safety, and transportation concerns.

4.4.6.3 Mitigation and Monitoring

No additional mitigation or monitoring is recommended.

4.4.6.4 Residual Impacts

General and project-specific safety procedures would be implemented; however, there could be some accidents. The rate, type, and severity of these accidents would be similar to those identified in the Cave Gulch EIS and would likely be rare.

4.4.6.5 Cumulative Impacts

Cumulative impacts within the CIAA would continue to include occupational hazards associated with the oil and gas development and field operations, risks associated with vehicle operation on improved and unimproved roads, potential vehicular collisions with big game or livestock, and natural hazards such as flash floods and range fires. These impacts would be minimized within the CIAA by implementation of appropriate mitigation/safety measures.

4.4.7 Wastes (Hazardous and Solid)

The Cave Gulch EIS concluded that there would be no significant impacts associated with hazardous or solid wastes.

4.4.7.1 Proposed Action

Under the Proposed Action, a limited quantity of hazardous and solid wastes would likely be generated by the Operators. However, no hazardous or solid wastes would be disposed of on-site, and the Operators would handle and dispose of all hazardous wastes in accordance with applicable state and federal rules and regulations. Any release of hazardous substances in excess of reportable quantities, established in Title 40 C.F.R. Part 117, would be reported as required by CERCLA (as amended). If a release of a reportable quantity of any hazardous substances occurs, a report would be provided to WDEQ and all other appropriate federal and state agencies.

Toilets would be provided for workers on-site and the waste would be properly disposed of through the septic system or at an approved waste disposal facility on an as-needed basis. Solid waste such as garbage and other discarded solid materials would be collected at designated collection sites and disposed of at an approved solid waste management facility. Solid waste would not be imported into or disposed of within the CGIDP area. Spills of petroleum products may occur due to periodic equipment maintenance and/or accidents. If such spills occur, petroleum-contaminated soils would be disposed of in accordance with direction from the BLM and/or WDEQ as appropriate. All non-hazardous material would be disposed of in accordance with appropriate local, state, and federal regulations.

Overall, impacts associated with hazardous and solid wastes would be negligible to low.

4.4.7.2 No Action Alternative

Under the No Action Alternative, the BLM would deny the Proposed Action, and no additional disturbance/development would occur beyond the levels previously authorized. Impacts from hazardous and solid waste would remain at existing levels and would be negligible to low.

4.4.7.3 Mitigation and Monitoring

No additional mitigation or monitoring is recommended.

4.4.7.4 Residual Impacts

Some environmental damage could occur should a spill or other accident occur; however, such accidents would likely be minor and cleaned up expeditiously.

4.4.7.5 Cumulative Impacts

Under *Resource Conservation and Recovery Act* regulations, there are no designated hazardous waste generators within the CIAA other than oil and gas operators registered as small-quantity hazardous waste generators. There are no designated hazardous waste treatment, storage, or disposal facilities or solid waste disposal facilities within the CIAA. As a result, any hazardous or solid waste generated by these facilities is handled in accordance with specific federal and state rules and regulations, and cumulative impacts would be negligible.
