**United States Department of the Interior**
**Bureau of Land Management**

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# Environmental Assessment
# Black Hills DeBeque Exploratory Proposal EA

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Grand Junction Field Office
2815 H Road
Grand Junction, Colorado 81506

DOI-BLM-CO-130-2012-0021-EA

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## List of Abbreviations and Acronyms

| | |
|---|---|
| µeq/l | microequivalents per liter |
| µg/L | micrograms per liter |
| $\mu g/m^3$ | micrograms per cubic meter |
| µS | microsiemens |
| ACEC | Areas of Critical Environmental Concern |
| ANC | acid neutralizing capacity |
| AO | Authorized Officer |
| APCD | Air Pollution Control Division |
| APDs | Applications for Permits to Drill |
| APE | Area of Potential Effect |
| AQRVs | Air Quality Related Values |
| ARPA | Archaeological Resources Protection Act |
| AUMs | animal unit months |
| BACT | Best Available Control Technology |
| BBC | BBC Research and Consulting |
| BBS | Breeding Bird Survey |
| BCC | Birds of Conservation Concern |
| bcf | billion cubic feet |
| BCR | Bird Conservation Regions |
| bdl | below detection limit |
| BEA | Bureau of Economic Analysis |
| bgs | below the ground surface |
| BHDEP | Black Hills DeBeque Exploratory Proposal |
| Black Hills | Black Hills Plateau Production, LLC |
| BLM | Bureau of Land Management |
| BLS | Bureau of Labor Statistics |
| BMPs | Best Management Practices |
| BOP | Blowout Preventer |
| BOR | Bureau of Reclamation |
| BTEX | benzene, toluene, ethyl benzene and xylene |
| Btu | British thermal unit |
| CAAQS | Colorado Ambient Air Quality Standards |
| CAS | Chemical Abstract Service |
| CASTNET | Clean Air Status and Trends Network |
| CDLE | Colorado Department of Labor and Employment |
| CDOLA | Colorado Department of Local Affairs |
| CDOT | Colorado Department of Transportation |
| CDOW | Colorado Division of Wildlife |

| | |
|---|---|
| CDPHE | Colorado Department of Public Health and Environment |
| CDNR-DWR | Colorado Department of Natural Resources Division of Water Resources |
| CE | Categorical Exclusion |
| CEAAs | Cumulative Effects Analysis Areas |
| CEQ | Council on Environmental Quality |
| CERCLA | Comprehensive Environmental Response, Compensation and Liability Act |
| CFR | Code of Federal Regulations |
| cfs | cubic feet per second |
| $CH_4$ | methane |
| cm | centimeter |
| CNHP | Colorado Natural Heritage Program |
| CO | carbon monoxide |
| $CO_2$ | carbon dioxide |
| $CO_2e$ | carbon dioxide equivalents |
| COAs | conditions of approval |
| COGCC | Colorado Oil and Gas Conservation Commission |
| CPW | Colorado Parks and Wildlife |
| CRS | Colorado Revised Statutes |
| CSUH | Colorado State University Herbarium |
| CUH | University of Colorado Herbarium |
| DATs | deposition analysis thresholds |
| dB | decibel |
| DOI | U.S. Department of the Interior |
| dv | deciviews |
| EA | Environmental Assessment |
| EIA | Energy Information Administration |
| EIS | Environmental Impact Statement |
| EO | Executive Order |
| EPA | U.S. Environmental Protection Agency |
| ERMA | Extensive Recreation Management Area |
| ESA | Endangered Species Act |
| $^oF$ | degrees Fahrenheit |
| FEMA | Federal Emergency Management Agency |
| FLAG | Federal Land Managers' Air Quality Related Values Work Group |
| FLMs | Federal Land Managers |
| FLPMA | Federal Land Policy and Management Act |
| FML | federal mineral lease |
| FMUs | Fire Management Units |
| FONSI | Finding of No Significant Impact |
| FWS | U.S. Fish and Wildlife Service |
| GAP | Gap Analysis Project |
| GHGs | greenhouse gases |
| GJFO | Grand Junction Field Office |
| GMU | Game Management Unit |
| gpm | gallons per minute |
| GRI | Grand River Institute |
| GWP | Global Warming Potential |
| HAPs | hazardous air pollutants |
| $HNO_3$ | nitric acid |
| hp | horsepower |
| HUC | hydrologic unit code |
| IDLH/10 | Immediately Dangerous to Life or Health divided by 10 |
| IDT | Interdisciplinary Team |
| IFMP | Interagency Fire Management Plan |
| IM | Instruction Memorandum |
| IMPROVE | Interagency Monitoring of Protected Visual Environments |

| | |
|---|---|
| IR | Interim Reclamation |
| kg/ha-yr | kilograms per hectare per year |
| km | kilometers |
| L | liter |
| MBTA | Migratory Bird Treaty Act |
| MEI | maximum exposed individual |
| MLA | Mineral Leasing Act |
| MLE | most likely exposure |
| mmhos | micromhos |
| MMIF | Mesoscale Model Interface Program |
| MOU | Memorandum of Understanding |
| mph | miles per hour |
| N | nitrogen |
| $N_2O$ | nitrous oxide |
| NAAQS | National Ambient Air Quality Standards |
| NADP | National Acid Deposition Program |
| NAGPRA | Native American Graves Protection and Repatriation Act |
| NAIP | National Agriculture Imagery Program |
| NEPA | National Environmental Policy Act |
| $NH_4$ | ammonium |
| NHPA | National Historic Preservation Act |
| NIOSH | National Institute for Occupational Safety and Health |
| $NO_2$ | nitrogen dioxide |
| $NO_3$ | nitrate |
| NPS | National Park Service |
| NRCS | Natural Resource Conservation Service |
| NRHP | National Register of Historic Places |
| NSO | no surface occupancy |
| NSPS | New Source Performance Standards |
| NTN | National Trends Network |
| $O_3$ | ozone |
| OAHP | Office of Archaeology and Historic Preservation |
| PAHs | polycyclic aromatic hydrocarbons |
| PBA | Programmatic Biological Assessment |
| PBO | Programmatic Biological Opinion |
| PCEs | primary constituent elements |
| PFC | Proper Functioning Condition |
| PFYC | Potential Fossil Yield Classification |
| PGH | Preliminary General Habitat |
| PL | public law |
| $PM_{2.5}$ | particulate matter less than 2.5 microns in effective diameter |
| $PM_{10}$ | particulate matter less than 10 microns in effective diameter |
| PPH | Preliminary Priority Habitat |
| PPR | Parachute/Piceance/Roan |
| PRPA | Paleontological Resources Preservation Act |
| PSD | Prevention of Significant Deterioration |
| PUP | Pesticide Use Proposal |
| PVC | polyvinyl chloride |
| RACT | Reasonably Available Control Technology |
| RAWS | Remote Automatic Weather Station |
| RELs | Reference Exposure Levels |
| RfCs | Reference Concentrations for Chronic Inhalation |
| RFD | Reasonably Foreseeable Development |
| RMBO | Rocky Mountain Bird Observatory |
| RMH | Rocky Mountain Herbarium |
| RMP | Resource Management Plan |

| | |
|---|---|
| RMPPA | Resource Management Plan Planning Area |
| RSO | Restricted Surface Occupancy |
| S | sulfur |
| SAR | Sodium Adsorption Ratio |
| SHPO | State Historic Preservation Office |
| SIP | State Implementation Plan |
| SNV | Scenic and Natural Values |
| $SO_2$ | sulfur dioxide |
| $SO_4$ | sulfate |
| SPCC | Spill Prevention, Control, and Countermeasure |
| SQRU | scenic quality rating units |
| SRPs | Special Recreation Permits |
| SSURGO | Soil Survey Geographic |
| SSC | suspended sediment concentrations |
| SUPO | Surface Use Plan of Operations |
| SVR | standard visual range |
| SWH | Sensitive Wildlife Habitats |
| SWMP | Storm Water Management Plan |
| TCA | Tree Cutting Area |
| TDS | total dissolved solids |
| tg | terragrams |
| TPH | total petroleum hydrocarbons |
| Twps | townships |
| URF | unit risk factors |
| USACE | U.S. Army Corps of Engineers |
| USC | United States Code |
| USDA | U.S. Department of Agriculture |
| USGS | U.S. Geological Survey |
| VIEWS | Visibility Information Exchange Web System |
| VOCs | volatile organic compounds |
| VRI | Visual Resource Inventory |
| VRM | Visual Resource Management |
| WCIU | Wilderness Character Inventory Unit |
| West-CARMMS | Western Colorado Air Resources Management Modeling Study |
| WGFD | Wyoming Game and Fish Department |
| WHR | Wild Horse Range |
| WoUS | Waters of the U.S. |
| WPMDP | Western Properties Master Development Plan |
| WQCC | Water Quality Control Commission |
| WRAP | Western Regional Air Partnership |
| WRCC | Western Regional Climate Center |
| WRF | Weather Research and Forecasting |
| WSA | Wilderness Study Area |
| WSDOT | Washington State Department of Transportation |
| WSR | Wild and Scenic Rivers |

# CHAPTER 1 - INTRODUCTION

## 1.1 IDENTIFYING INFORMATION

BACKGROUND: In the fourth quarter of 2008, Black Hills Plateau Production, LLC (Black Hills) submitted the Black Hills Western Properties Master Development Plan (WPMDP) for oil and gas exploration to the Bureau of Land Management (BLM) Grand Junction Field Office (GJFO). The WPMDP proposed a 5 year phased program of oil and gas exploration and development on federal and private leases by drilling up to 104 wells on 64 new well pads and 12 existing well pads. The proposal included drilling and producing vertical wells from the Dakota formation. The BLM conducted public scoping in early 2009 and initiated an Environmental Assessment (EA).

In December, 2011, Black Hills replaced the WPMDP, submitting the Black Hills DeBeque Exploratory Proposal (BHDEP) to the BLM. The new proposal, planned over 3 years, targets the Mancos Shale formation and proposes horizontal rather than vertical wells. This change in drilling plans would allow Black Hills to reduce the proposed number of well pads from 76 to 12 and the number of wells from 104 to 24. The project name change, from Master Development Plan to Exploratory Proposal, also reflected the new proposal's aim to take advantage of emerging "down-hole" or geological information and resultant evolving drilling technologies to better approach it. Black Hills updated their Exploratory Proposal in October 2012, January 2013, and April 2013. In October 2012, the update provided additional detail. The update in January 2013 reduced the proposed size of well pads from 10 acres to 6.8 acres. The update in April 2013 was in response to public comment.

As the Proposed Action of this EA, the BHDEP now proposes a 3-year program of oil and gas exploration on federal and private leases. Black Hills proposes to drill up to 24 wells on 12 new well pads, four of which are adjacent to or replace existing well pads. The Proposed Action consists of construction, operation, maintenance and abandonment of well pads, wells, roads, gas gathering pipelines, produced water lines, water supply lines and centralized facilities. This EA, prepared by the BLM GJFO, responds to Black Hills' DeBeque Exploratory Proposal. Construction and operation of the BHDEP would allow for production of up to 144 billion cubic feet (bcf) of natural gas over the life-of-the project, estimated to be 20 years.

This EA was prepared in conformance with the policy guidance provided in the BLM's National Environmental Policy Act (NEPA) Handbook H-1790-1 (BLM, 2008a). The BLM Handbook provides instructions for compliance with the Council on Environmental Quality (CEQ) regulations for implementing the procedural provisions of NEPA (40 CFR §1500-1508) and U.S. Department of the Interior (DOI) Manual 516 DM 1-7 on NEPA compliance (DOI, 2005).

CASEFILE/PROJECT NUMBER: DOI-BLM-CO-130-2012-21-EA

PROJECT NAME: Black Hills DeBeque Exploratory Proposal

PLANNING UNIT: Grand Junction Field Office

## 1.2 PROJECT LOCATION AND LEGAL DESCRIPTION

The BHDEP area (project area) is located generally west, southwest and south of the Town of De Beque Colorado. The project area boundary encompasses three separate BLM-designated oil and gas units, including the Homer Deep Unit (12,529 acres), the Winter Flats Unit 7,811 acres) and the Horseshoe Canyon Unit (8,000 acres). It also included the Wagon Track Non-Unitized area.

Topographically, moving clockwise from the north, the project area may be roughly described as being bounded by Horse Mountain to the north, the Roan Cliffs to the north and east, Sand

Wash and Black Mountain to the east and south, Monument and Horseshoe Canyons to the south, Main Canyon to the south and west, Bronco Flats to the west-southwest and Corcoran Peak and Corcoran Wash to the west and west-northwest. In the Public Land Survey System (6th Principal Meridian), parts of the following Townships (Twps) and Ranges lie within the project boundary: In Twp 8 South, Ranges 97, 98, 99, 100 West; in Twp 9 South, Ranges 97, 98, 99, 100 West.

The Colorado River and Interstate-70 bisect the project area; the Homer Deep and Winter Flats units and the Wagon Track Non-Unitized Area lie to the north and west of the Colorado River and Interstate-70. The Horseshoe Canyon Unit is located to the southeast (see Map 1.2-1). The project area includes roughly 79,793 acres of federal (63,031acres) and private (16,762 acres) surface ownership (see Map 1.2-2). There are some split estate lands with federal surface and private minerals and/or private surface and federal minerals.

Primary access to the Homer Deep Unit is via Interstate-70, Mesa County 45 Road (Roan Creek Road) and Garfield/Mesa County Road 200 (Dry Creek Road). Primary access to the Winter Flats Unit and Wagon Track Non-Unitized Area is Interstate-70, Mesa County 45 Road (Roan Creek Road), Town of De Beque surface streets and Mesa County V.2 Road (Winter Flats Road). Mesa County V.6 Road provides westerly access through the Winter Flats Unit. Mesa County S Road provides continued access to the Wagon Track Non-Unitized Area. Primary access to the Horseshoe Canyon Unit is Roan Creek Road to Mesa County 45.5 Road to Horse Canyon Road.

LEGAL DESCRIPTION:

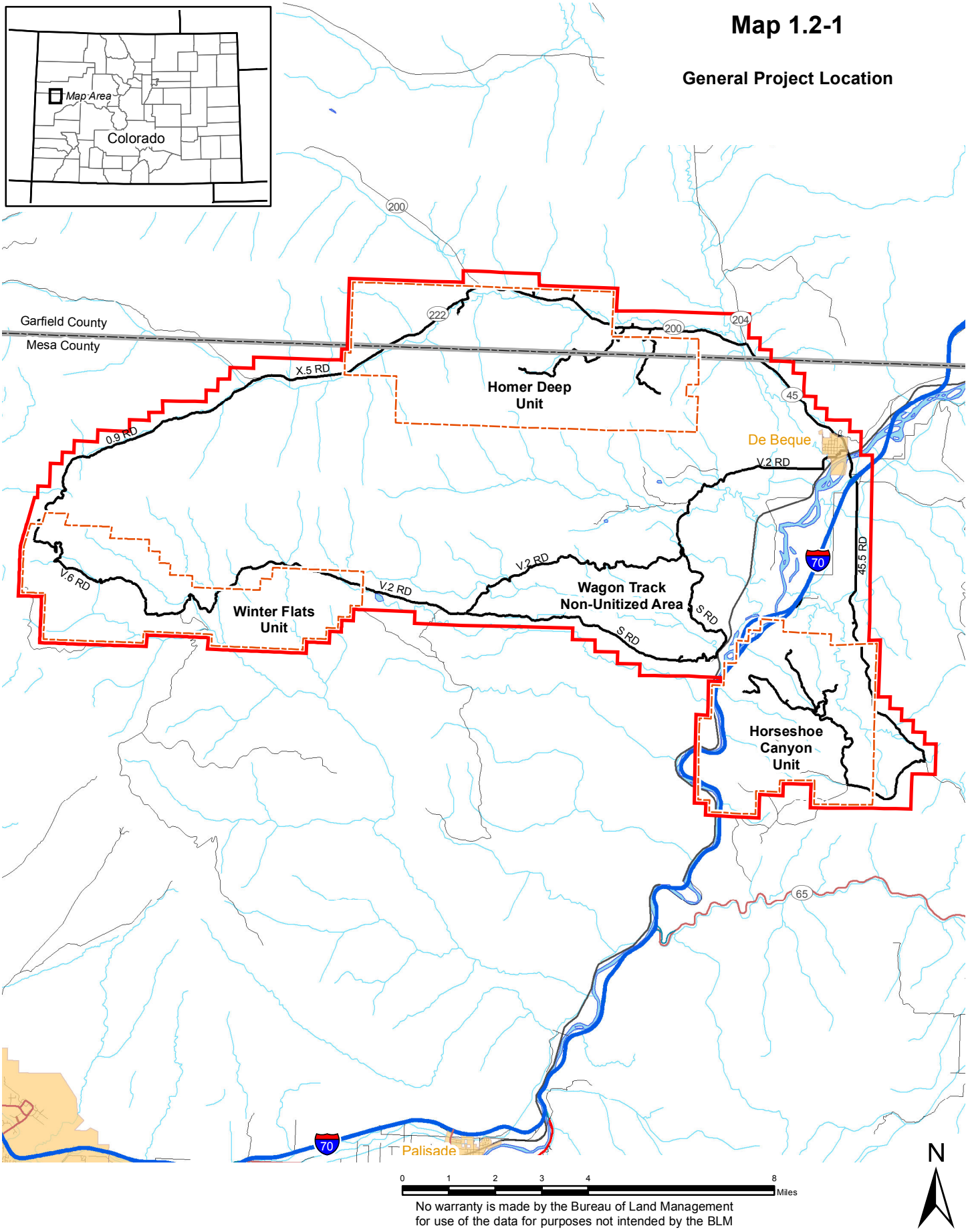
The legal description for the project area is provided in Appendix A.

USGS Quadrangles: Corcoran Peak, The Saddle, Long Point, Winter Flats, Wagon Track Ridge, DeBeque, Cameo and Mesa.

## 1.3 PURPOSE AND NEED

The purpose and need for the Proposed Action is exploration of the oil and gas resources in the project area. Approval of Applications for Permits to Drill (APDs) and Sundry Notices would be consistent with other existing lease activities in the area and ultimately provide for federal lease development. If permitted, this Proposed Action would include implementation of appropriate mitigation that would be consistent with the goals, objectives and decisions of the Grand Junction Resource Area (now referred to as the GJFO) Resource Management Plan (RMP) (BLM, 1987); as well as with applicable policies, regulations and laws. Permitting of the Proposed Action would allow Black Hills to exercise their rights to explore a leased resource and would support the goal of continuing to meet the nation's energy needs.

The purpose of the Proposed Action is to permit Black Hills to discover and produce fluid minerals from their valid federal oil and gas leases issued to them by the BLM. The need for the Proposed Action is established under the Mineral Leasing Act of 1920 (MLA) and the Federal Land Policy and Management Act of 1976 (FLPMA), which establish the BLM's responsibility to respond to drilling applications. The MLA, as amended (30 USC 181 et seq.), authorizes the BLM to issue oil and gas leases for the exploration of oil and gas and permit the development of those leases. Existing leases are binding legal contracts that allow development by the lease holder. Approved BLM applications to drill typically authorize an applicant to construct and drill proposed wells, access, associated pipeline and well facility construction and any necessary rights-of-way. The FLPMA authorizes the BLM to issue right-of-way grants for access to public lands.


Map 1.2-1
General Project Location
Map Area
Colorado
Garfield County
Mesa County
Homer Deep Unit
Winter Flats Unit
Wagon Track Non-Unitized Area
Horseshoe Canyon Unit
De Beque
Palisade
X.5 RD
0.9 RD
V.6 RD
V.2 RD
S RD
45.5 RD
200
222
204
45
70
65
N
0 1 2 3 4 8 Miles
No warranty is made by the Bureau of Land Management
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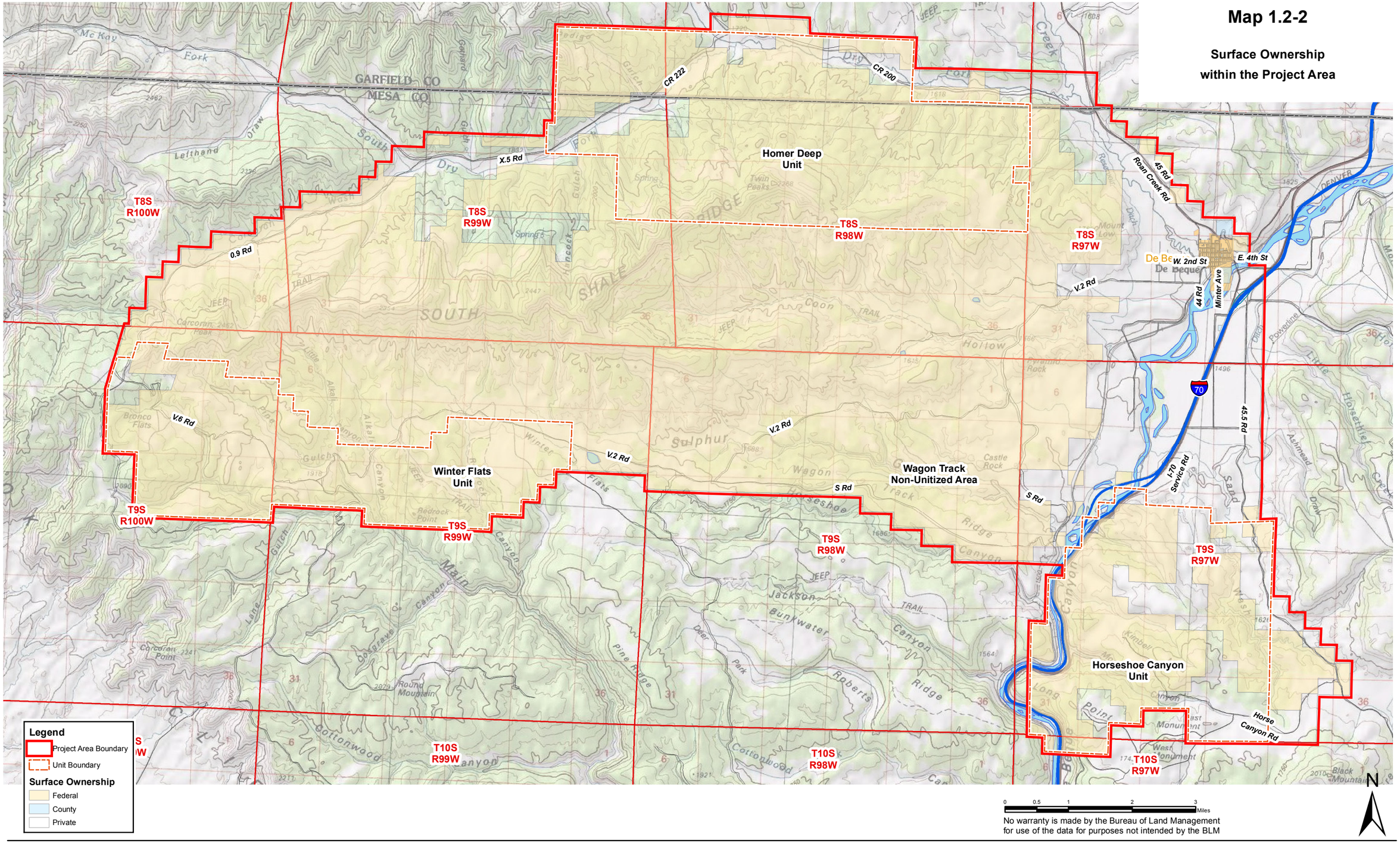
## Map 1.2-2

**Surface Ownership within the Project Area**




No warranty is made by the Bureau of Land Management for use of the data for purposes not intended by the BLM

The construction and production of Black Hills proposed 24 wells on 12 pads would allow them to explore and develop their leased resources and could provide additional fluid mineral resources to the national energy market.

## 1.4 PLAN CONFORMANCE REVIEW

PLAN CONFORMANCE REVIEW: The Proposed Action is subject to and has been reviewed for conformance with the following plan (43 CFR 1610.5, BLM 1617.3):

Name of Plan: GRAND JUNCTION Resource Management Plan

Date Approved: JANUARY, 1987

Decision Number/Page: Page 2-7

Decision Language: To make federal oil and gas resources available for leasing, except where prohibited by law or where administrative action is justified in the national interest; to make public lands available for economically and environmentally sound exploration and development projects; to avoid health and safety hazards; to protect important sensitive resource values from unacceptable impacts; and to minimize impacts to lessees from sensitive resource protection and hazard avoidance.

The BLM has determined that the alternatives analyzed in this EA would be in compliance with the Oil and Gas Management objective in the RMP. This project has been reviewed and the BLM has determined that a decision would not harm resource values so as to limit the choice of reasonable alternative actions relative to the land use plan decisions being reexamined in the Grand Junction Draft RMP and Environmental Impact Statement (EIS).

In January 1997, the Colorado State Office of the BLM approved the Standards for Public Land Health and amended all RMPs in the State. Standards describe the conditions needed to sustain public land health and apply to all uses of public lands.

Standard 1: Upland soils exhibit infiltration and permeability rates that are appropriate to soil type, climate, land form and geologic processes.

Standard 2: Riparian systems associated with both running and standing water function properly and have the ability to recover from major disturbance such as fire, severe grazing, or 100-year floods.

Standard 3: Healthy, productive plant and animal communities of native and other desirable species are maintained at viable population levels commensurate with the species and habitat's potential.

Standard 4: Special status, threatened and endangered species (federal and state) and other plants and animals officially designated by the BLM and their habitats are maintained or enhanced by sustaining healthy, native plant and animal communities.

Standard 5: The water quality of all water bodies, including ground water where applicable, located on or influenced by BLM lands will achieve or exceed the Water Quality Standards established by the State of Colorado.

Because standards exist for each of these five categories, a finding must be made for each of them in an environmental analysis. These findings are located in this document.

## 1.5 PUBLIC PARTICIPATION

### 1.5.1 Public Scoping

NEPA regulations (40 CFR §1500-1508) require that the BLM use a scoping process to identify potential significant issues in preparation for impact analysis. The principal goals of scoping are to allow public participation to identify issues, concerns and potential impacts that require detailed analysis.

A news release and a letter to the public outlining Black Hills' DeBeque Exploratory Proposal as well as the BLM's intent to prepare an EA analyzing the proposal were posted pursuant to the NEPA process. The Exploratory Proposal, the news release, the letter to the public and a map were posted on the BLM GJFO website at; http://www.blm.gov/co/st/en/fo/gjfo.html. The BLM invited the public to provide comments on the proposal for 30 days beginning January 11, 2012 through February 13, 2012. No public scoping meetings were held.

During the comment period, nine comment letters/emails were received, including one from Colorado Parks and Wildlife, one from Mesa County, three from business and industry, two from environmental advocacy groups and two from individuals. Comments received during the public comment period have been considered as part of this impact analysis.

Issues raised during the public comment period are summarized by resource below:

*Alternatives*. Commenters asked the BLM to consider alternatives that would allow the action to go forth in a less environmentally damaging manner including an alternative with No Surface Occupancy (NSO) stipulations. One specific comment suggested that the EA assess an alternative requiring Black Hills to drill the proposed well from its existing well pads.

*Air Quality*. Comments suggest conducting thorough and updated analyses of all air emissions specifically estimates of drill rig emissions; analysis of impacts to ambient air quality, requiring stipulations and mitigations that call for air quality monitoring data to be collected in the gas field and new development units; the identification of potential impacts from greenhouse gases as well as a discussion as to how the BLM will consider and analyze the potential effects of authorized activities on air resources. One comment asked that the BLM ensure that emissions from the proposed gas wells are aggregated together with interrelated and adjacent compressors and other developments to comply with Prevention of Significant Deterioration (PSD) regulations and Colorado State Implementation Plans (SIPs). Comments also express concern about dust from traffic and construction activities.

*Connected Actions*. One commenter asked the BLM to take into consideration all impacts related to connected actions.

*Cultural*. Several comments addressed cultural resources, specifically requesting surveys and inventories, consultations to address Native American concerns within the project area and the development of a Cultural Resource Management Plan, as well as measures to protect the resources from collectors, looters, thieves and vandals.

*Cumulative Impacts*. One commenter requested an analysis of the indirect and cumulative environmental impacts of both the proposed development project and other foreseeable connected activities within the same general areas.

*Fish and Wildlife*. Colorado Parks and Wildlife (CPW) and other commenters recommend compliance with the Wildlife Mitigation Plan signed in 2010, to avoid, minimize and mitigate impacts to wildlife and wildlife habitat. Additional comments centered on the disruption/removal/fragmentation of habitat. Specific recommendations include phased and concentrated development, avoidance and requiring densities of 10 pads per 10-square mile area or less to minimize disturbance of wintering wildlife; habitat mitigation, installing escape ramps on disposal pits, road closures to reduce traffic impacts to wildlife and bear proof containers for trash.

*General*. General comments suggest concern about significant impacts to the area's landscape and habitat. One landowner is concerned about plans to drill on their property and would like to be kept informed of the project. One advocacy group included an attachment with a list of values present within the Proposed Action that should be considered in the EA.

*Geology and Soils*. Commenters recommend a thorough and updated analysis of the soil status in the area, strong buffer setbacks for slopes greater than 25 percent and no surface occupancy in areas where slopes adjoin water bodies.

*Grazing*. One landowner expressed concern about how the project will impact his grazing rights.

*Hazardous Materials and Waste*. Comments asked for additional information regarding the handling of produced waters and hydraulic fracturing.

*Land Use*. One landowner raised questions regarding future development and possible drainage of minerals on his land and how the project will impact his ranching operations.

*Monitoring and Mitigation*. One commenter suggested that the BLM follow recently revised guidance and policy for mitigation requirements for use during a Finding of No Significant Impact (FONSI) completed by the CEQ in 2011; and clearly outline in the EA how mitigation will be monitored and changed if not working.

*Paleontology*. Comments suggest a determination of paleontological sites in the project area and protection of these resources. Comments recommend adopting measures to protect any specimens from looters, thieves and vandals.

*Process/Policy*. Comments suggest the need to review the project under an EIS instead of an EA based on the level of impacts. It was recommended that the BLM consider the project as full-field development rather than an exploratory proposal. Commenters expressed concern that the RMP (currently under revision) will not provide adequate protection or mitigation criteria to prevent environmental harm and a more thorough review should be required. One comment asked that the BLM not consider a Categorical Exclusion (CE) review for this project. Additionally, it was suggested that the BLM consider three proposals to evaluate each area separately to allow development to proceed in some areas and not in others that have conflicts or resource concerns. High Lonesome Ranch would like to be given higher consideration and request the equivalent of cooperating agency status for the proposal to adequately protect their property rights. One landowner expressed concern about the $1,000 bond to cover potential damage to his home and property. Mesa County specifically addressed the permits required

and the asked that the project comply with applicable provisions of the Mineral and Energy Resources Plan.

*Proposed Action*. One commenter asked if there is a proposed pipeline in the project area and would like clarification regarding the location of the Homer Deep Unit Centralized Facilities #2 and #3. It was noted that the facilities will require easements from Chevron if they are located on their land. Commenters ask that the BLM disclose and adequately analyze techniques used in drilling the proposed wells (e.g., hydraulic fracturing) and potential impacts of those techniques. Questions were asked regarding what formations Black Hills is targeting and how deep the wells will be and if wells are being horizontally drilled, what is the lateral reach of these wells. One comment asked the agency to consider what logical build-out would look like given current understanding of technology, geology and contemporary industry practices.

*Reclamation*. Comments suggest evaluation and monitoring reclamation efforts to ensure high germination and survival rates to reduce the amount of surface runoff and soil erosion.

*Recreation*. One landowner expressed concern about the impacts to the hunting and fishing operations on and adjacent to the proposed development and to the recreational, agricultural and educational activities conducted on his ranch.

*Socioeconomics*. Comments recommend addressing the negative socioeconomic effects that development might have on the area and asked that the BLM present data that fully accounts for impacts from habitat fragmentations, loss of quality of life, loss of recreation, effects on tourism, recreation, hunting and fishing, including an analysis of income and jobs in these industries for each alternative.

*Special Management Areas*. Comments asked the BLM to address impacts and limit disturbance to areas designated as Visual Resource Management (VRM) Class 1, Areas of Critical Environmental Concern (ACECs) and all citizens' wilderness proposals such as the proposed Coon Hollow/South Shale Ridge ACEC, Hunter Canyon, Cow Ridge and Little Bookcliffs. Recommendations include evaluation of specific best management practices and special resource protection measures for these areas.

*Special Status Species*. Commenters asked the BLM to look at direct and indirect impacts to special status species by the Proposed Action. Recommendations include surveys, avoidance, protective buffers and compliance with management guidelines to protect habitat.

*Transportation and Access*. Mesa County addressed impacts to roads due to increased use and requests that users and the County come to an agreement to contribute to upkeep of the roads. One commenter asked that Black Hills consider paving/upgrading Mesa County 44 Road to Mesa County V.5 Road for industrial use. Another comment expresses concerns about access routes across the High Lonesome Ranch lands and the overall impacts from industrial traffic on the ranch and recreation business.

*Vegetation*. Comments recommend that all alternatives contain a thorough and updated analysis of the vegetation status (including the age and condition of critical habitat) in the project area.

*Water Resources*. Comments express concern about water rights and proposed withdrawals on the Roan and Plateau creeks. Chevron's comments specifically address the water supply contract for water purchased from the Colorado River Water Conservation District and

recommends executing the contract prior to permitting and pumping water directly into Latham Ponds to avoid affecting Chevron's water rights. Additional comments recommend groundwater surveys to develop an understanding of geologic features for handling injected water.

### 1.5.2 Internal Scoping

Several internal scoping meetings for the project were held with the BLM GJFO Interdisciplinary Team (IDT). Screening of potential impacts to resources was conducted through internal scoping and site visits. Table 3.1-1 (Chapter 3) lists the results of the initial screening process.

### 1.5.3 Public Comment

A press release seeking public comment on the preliminary EA was posted on the BLM GJFO website at; http://www.blm.gov/co/st/en/fo/gjfo.html on January 7, 2013. The preliminary EA was also posted. The BLM invited the public to provide comments on the EA for 30 days beginning January 7, 2013 through February 6, 2013. No public meetings were held.

Thirteen comment letters were received including one letter from an agency (CPW), five letters from business and industry, three letters from elected officials, two letters from individuals, and two letters from local governments. CPW submitted their comment letter on February 11, 2013 which is after the close of the comment period (CPW, 2013). The BLM's responses to the public comments are provided in Appendix B.

## 1.6 DECISION TO BE MADE

The BLM decision-makers will decide, based on the analysis contained in this EA, whether or not to authorize the Proposed Action. The Decision Record associated with this EA does not constitute the final approval for all actions, such as approval of all individual APDs, Rights-of-Ways and Sundry Notices associated with the Proposed Action. The EA does, however, provide the BLM's Authorized Officer (AO) with information upon which to consider approving individual project components such as APDs, Rights-of-Ways and Sundry Notices.

# CHAPTER 2 - PROPOSED ACTION AND ALTERNATIVES

## 2.1 INTRODUCTION

The purpose of this chapter is to provide information on the Proposed Action and alternatives. No alternatives have been identified that are not carried forward for analysis.

## 2.2 ALTERNATIVES ANALYZED IN DETAIL

### 2.2.1 Proposed Action

Black Hills operates approximately 75 wells in the BHDEP area. Some wells were drilled as early as 1978. Most existing wells were drilled as vertical wells into the Dakota Formation. Due to recent advances in drilling technology and new geologic information, Black Hills is planning to explore using horizontal drilling into the Mancos Formation. Construction and operation of the Proposed Action would allow for an estimated production of up to 144 bcf of natural gas over the life-of-the project, estimated at 20 years.

The Proposed Action consists of construction, operation, maintenance and abandonment of oil and gas well pads, wells, roads, gas gathering pipelines, produced water lines, water supply lines and centralized facilities. Under the Proposed Action, Black Hills would exercise the right to develop oil and gas resources under their existing federal leases. Black Hills is proposing to drill, complete and operate 24 wells on 12 new well pads. Eleven of the well pads would be located on BLM-administered lands and wells drilled from these pads would be into federal minerals for which Black Hills has existing leases.

Table 2.2-1 shows a listing of the federal leases, the proposed well pad to which lease stipulations would apply and a summary of that lease's stipulation(s). A full list of the lease stipulations is provided in Appendix C. The older leases (early 1970s) do not include stipulations specific to resource protections, because the RMP requiring such lease stipulations did not take effect until 1987 (BLM, 1987). However, the newer leases (after 1990) include stipulations to protect wintering big game, outstanding scenic and natural landscape values, potential coal leasing conflicts and Endangered Species Act (ESA) issues. Protection of threatened and endangered species is also required under the ESA, regardless of lease stipulations. A single horizontal hole might affect several leases; however, the specific lease stipulations that would apply are for the lease underlying the well pad.

In addition to proposed exploration on BLM-administered lands with federal mineral ownership (federal/federal), Black Hills is proposing exploration on private lands with private mineral ownership (Horseshoe Canyon Unit 1-21). Table 2.2-2 shows the proposed well pad locations and surface and mineral ownership. For purposes of analysis, it is assumed that two wells would be drilled on proposed well pad HSC 1-21 on private lands and private minerals and the other 22 wells would be drilled on well pads located on BLM-administered lands and federal minerals.

Construction and operation of the Proposed Action would be in accordance with the design features and protective and mitigation measures provided in Black Hills DeBeque Exploratory Proposal (Black Hills, 2013). The proposal includes a Transportation Plan (Appendix D) and a Biological Resources Protection Plan (Appendix E). Black Hills has incorporated the measures included in the BLM's GJFO Standard Surface Use Conditions of Approval for Oil and Gas (BLM GJFO Standard COAs) in the BHDEP (Appendix F). Construction of the Proposed Action would also be in accordance with these measures. Black Hills is proposing to implement the same design features and protective and mitigation measures on private lands as they are for BLM-administered lands in accordance with landowner agreements.

**Table 2.2-1**
**Proposed Well Pads and Lease Stipulations by BLM Lease Number[1]**

| Lease Number | Effective Lease Date | Well Pad[1] | Lease Stipulation |
|---|---|---|---|
| COC-012733A | June 1, 1971 | Homer Deep Unit 9-11<br>Homer Deep Unit 9-41 | None |
| COC-012736<br>COC-067159 | June 1, 1971<br>December 1, 2003 | Homer Deep Unit 7-23 | None<br>ESA<br>Deer and Elk Ranges |
| COC-012736 | June 1, 1971 | Homer Deep Unit 17-43 | None |
| COC-012737 | June 1, 1971 | Homer Deep Unit 24-11 | None |
| COC-012651A | April 8, 1971 | Winter Flats 10-31-99 | None |
| COC-046161 | January 1, 1988 | Wagon Track 12-16 | Coal Leasing Amendment |
| COC-055607 | January 1, 1994 | DeBeque Canyon 1-13 | Scenic and Natural Values<br>Deer and Elk Range |
| COC-012643A | June 1, 1971 | Horseshoe Canyon Unit 5-16 | None |
| COC-012644 | June 1, 1971 | Horseshoe Canyon Unit 1-20<br>Horseshoe Canyon Unit 1-22 | None |

[1] Well pad Horseshoe Canyon Unit 1-21 overlies private minerals and is not shown in the table.

**Table 2.2-2**
**Proposed Well Pad Locations with Surface and Mineral Ownership**

| Well Pad Name | T | R | Section | Surface Qtr/Qtr | Surface/Mineral Ownership |
|---|---|---|---|---|---|
| Homer Deep Unit 9-41 | 8S | 98W | 9 | NENE | Federal/Federal |
| Homer Deep Unit 9-11 | 8S | 98W | 9 | NENE | Federal/Federal |
| Homer Deep Unit 7-23 | 8S | 98W | 7 | NWSE | Federal/Federal |
| Homer Deep Unit 17-43 | 8S | 98W | 17 | NESE | Federal/Federal |
| Homer Deep Unit 24-11 | 8S | 98W | 24 | NWNW | Federal/Federal |
| Winter Flats 10-31-99 | 9S | 99W | 10 | NWNE | Federal/Federal |
| Wagon Track 12-16 | 9S | 98W | 12 | SESE | Federal/Federal |
| DeBeque Canyon 1-13 | 9S | 98W | 13 | SESE | Federal/Federal |
| Horseshoe Canyon 5-16 | 9S | 97W | 16 | SWSW | Federal/Federal |
| Horseshoe Canyon 1-20 | 9S | 97W | 20 | NWSW | Federal/Federal |
| Horseshoe Canyon 1-22 | 9S | 97W | 22 | SWNW | Federal/Federal |
| Horseshoe Canyon 1-21 | 9S | 97W | 21 | SWSW | Private/Private |

### 2.2.1.1 Surface Disturbance by Wellfield Component

Table 2.2-3 provides estimates of short-term and long-term disturbance for each wellfield component (see Map 2.2-1). The estimates of disturbance in Table 2.2-3 include proposed components on BLM-administered lands and on private lands. Approximately 58 percent of disturbance would occur on BLM-administered lands and 42 percent would occur on private lands.

**Table 2.2-3**
**Estimated Short-Term and Long-Term Surface Disturbance as a Result of Oil and Gas Exploration**

| Component | Length or Number of Sites | Estimated Short-Term Surface Disturbance (acres) | | | Estimated Long-Term Surface Disturbance (acres) |
|---|---|---|---|---|---|
| | | Federal | Private | Total | |
| Well Pads | 12[1] | 104.82 | 8.76 | 113.58[2] | 36.00[3] |
| New Resource Roads | 0.98 mile | 4.00 | 0.39 | 4.39 | 4.39[4] |
| Upgrade Local Roads | 11.58 miles | 2.44 | 1.82 | 4.26[5] | 0.00 |
| Local Road Re-Route | 0.10 mile | 0.17 | 0.00 | 0.17[6] | 0.17 |
| Gas, Water Supply, Produced Water Pipelines | 25.35 | 63.41 | 69.35 | 132.76[7] | 0.00 |
| Buried Water Supply Pipeline | 1.14 | 0.00 | 6.29 | 6.29[8] | 0.00 |
| Surface Water Supply | 19.04 | 0.00 | 0.00 | 0.00[9] | 0.00 |
| Centralized Facilities | 4 | 0.00 | 38.49 | 38.49 | 38.49 |
| | **Total** | **174.84** | **125.10** | **299.94[11]** | **79.05** |

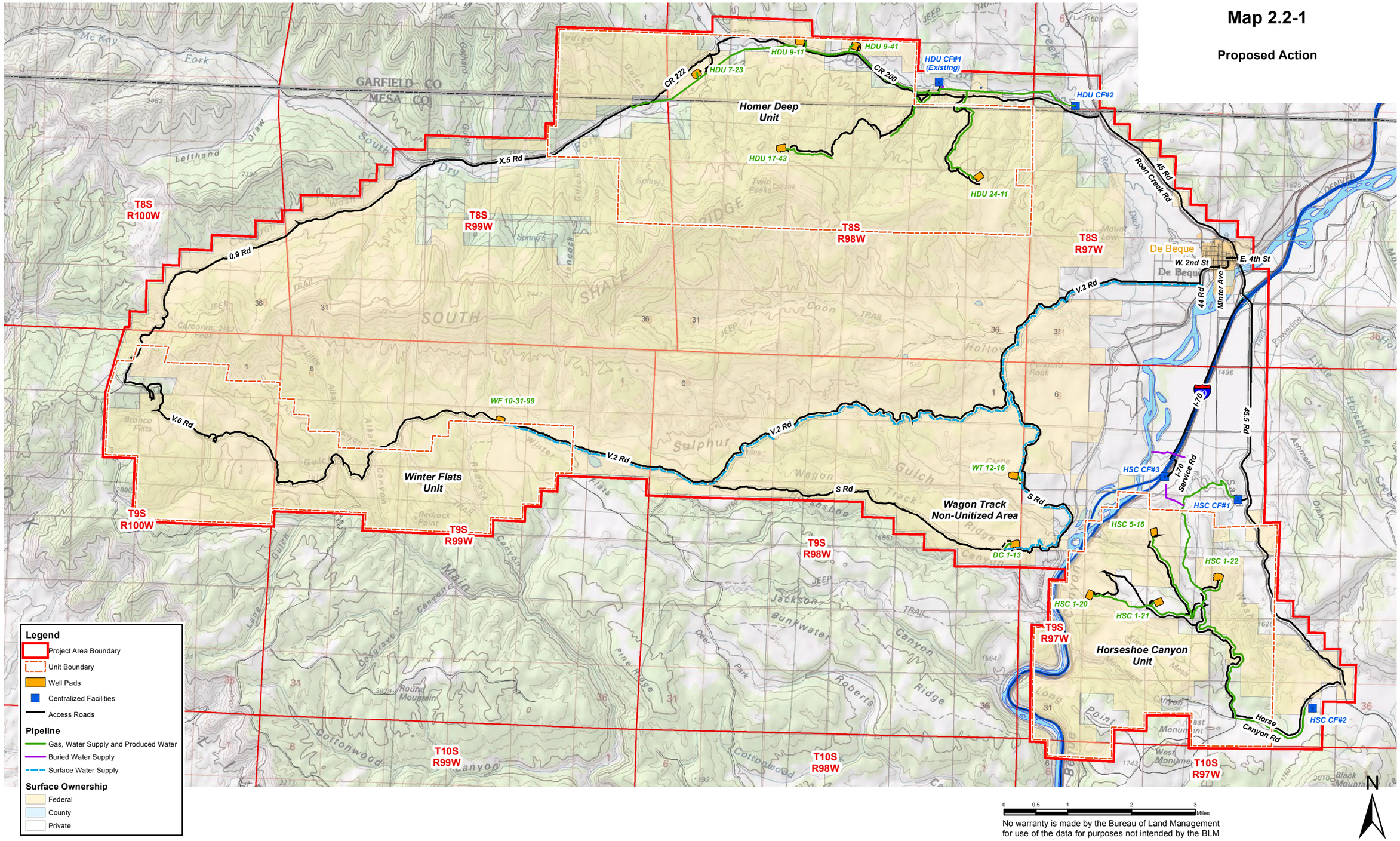
[1] Some well pads might be placed adjacent to or coincidental with existing well pads. The proposed disturbance includes an estimated 4.3 acres of existing disturbance for existing well pads.
[2] For purposes of analysis, each proposed well pad is estimated at approximately 10 acres of disturbance allowing for cuts and fills and storm water BMPs; however, actual well pad disturbance would not exceed 6.8 acres resulting in about 81.6 acres of disturbance for well pads.
[3] Assumes 3.0 acres of long-term disturbance per well pad.
[4] Assumes resource roads would be constructed with new well pads.
[5] Assumes 9.47 miles of road would be upgraded with pipeline installation and would be within the 50 feet disturbance width for the pipelines. Assumes 2.11 miles of road would require upgrading in a 40 foot disturbance width without adjacent pipeline installation.
[6] Local road re-route is associated with proposed HDU 24-11 well pad.
[7] Assumes 50 foot width is required for buried gas, water supply and produced water pipeline installation.
[8] Assumes approximate 50 foot disturbance width is required for buried water supply pipeline.
[9] No surface disturbance is required for surface water supply pipeline.
[10] Assumes each centralized facility would require about 10 acres of disturbance allowing for cuts and fills and storm water BMPs. All centralized facilities would be long-term disturbance.
[11] Actual short-term disturbance is estimated at 268 acres with 6.8 acre well pads.

**Wells and Well Pads.** Up to 24 wells on 12 well pads are proposed to be constructed over a 3-year period. Eight wells could be drilled and completed per year for three years with up to two wells drilled on each well pad. No more than two drilling rigs would be operating at a given time, but a completion rig might be operating in the area at the same time as two drilling rigs.

Black Hills estimates that constructing a single new well pad would disturb up to 6.8 acres including cuts and fills and installation of storm water Best Management Practices (BMPs) resulting in about 81.6 acres of disturbance for the 12 proposed well pads. If the wells under the Proposed Action were productive, and more wells were drilled on the pads, well pads and their disturbance areas could be expanded to up to 10 acres to accommodate more wells. This would result in about 114 acres of disturbance.

## Map 2.2-1

**Proposed Action**

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Well pads were initially proposed, surveyed and staked at 10 acres of disturbance each, so for purposes of this analysis, 10 acre well pads are analyzed in this document. However, Black Hills revised their disturbance estimate to only 6.8 acres per well pad and is now proposing such for the purposes of the DeBeque Exploratory Proposal. Site grading plans for the 10 acre well pads are included in Appendix G.

For analysis, the reduced well pads of up to 6.8 acres each are proposed to be considered as being located within the disturbances already depicted on the survey plats/site grading plans. Following interim reclamation of any approved 6.8 acre location, after wells had been drilled on the pad, a working area of about 3.0 acres per well pad would remain as disturbance for the life of the long-term production phase of the wells. Such long-term surface disturbance for all interim-reclaimed and producing well pads is estimated at 36.0 acres. Long-term disturbance refers to bare ground and does not include reclaimed areas.

**Roads.** Existing Mesa County, BLM, Town of De Beque and private roads would generally be used for access to and throughout the project area (see Map 2.2-2 and Black Hills' Transportation Plan – Appendix D). Mesa and Garfield counties maintain approximately half of the roads that would be used for access, the Town of De Beque maintains approximately 1 percent, and Black Hills would maintain the remaining roads. Black Hills would obtain all necessary permits required from Mesa and Garfield counties to use and maintain county roads. Some county roads are located on BLM lands. Black Hills and its contractors would comply with provisions of De Beque's municipal code addressing the use and maintenance of town streets.

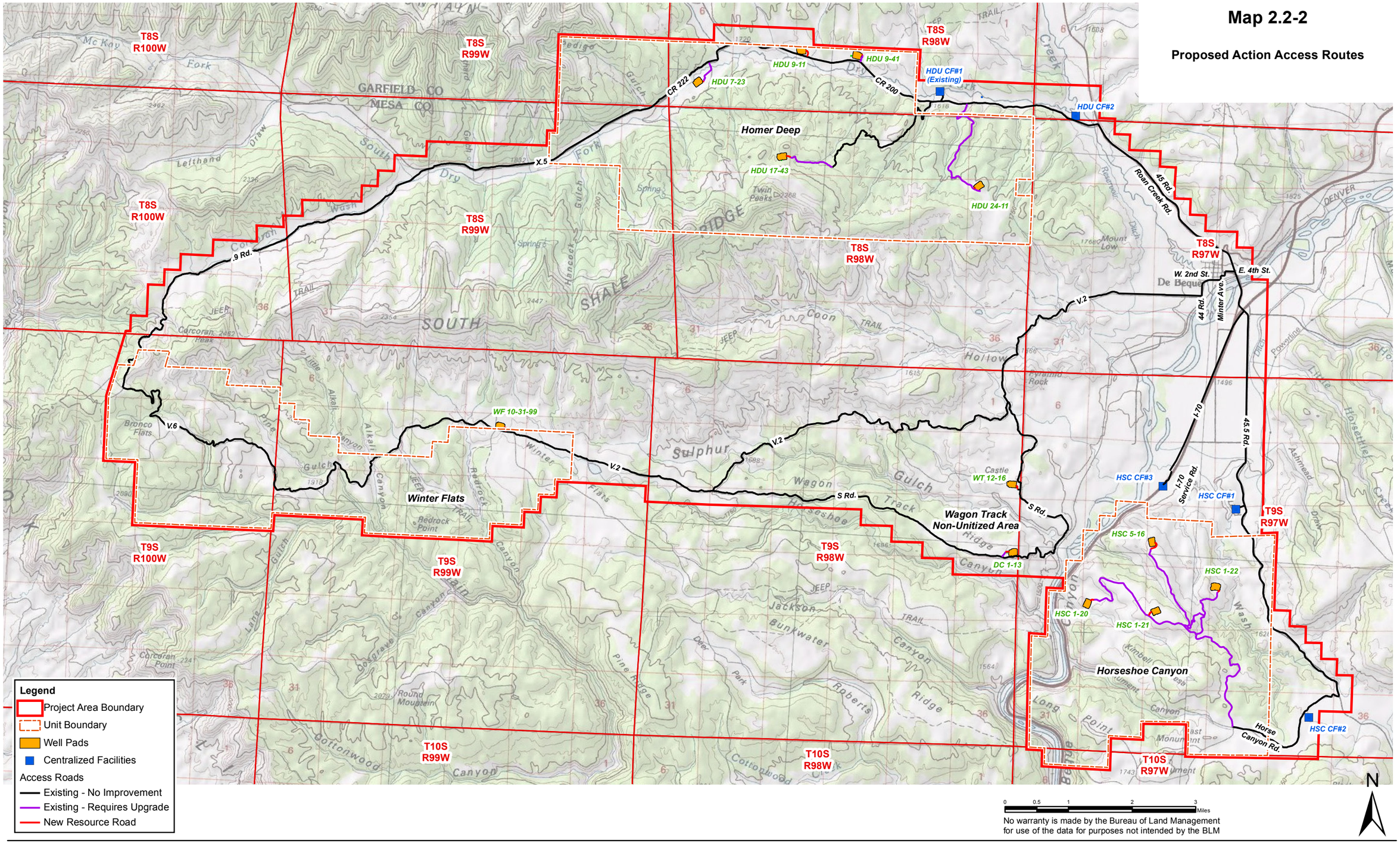
To provide access to proposed well pads, Black Hills would upgrade about 11.58 miles of existing two-track roads (local roads), generally on BLM surface. For purposes of analysis and disturbance calculations, it is assumed that proposed adjacent pipelines would be installed along existing roads at the same time the roads were being upgraded. These combined activities are proposed to take place within a permitted 50 foot disturbance. Black Hills would construct 0.98 mile of new resource roads to access individual well pads, at a disturbance width of 35 feet, requiring a disturbance of 4.39 acres. About 530 feet of a local road near proposed well pad HDU 24-11 would require a disturbance of about 0.17 acre. All upgraded and new roads would be constructed according to Gold Book road standards (BLM and Forest Service, 2007).

**Pipelines.** Black Hills is proposing to install 25.35 miles of gas gathering, water supply and produced water pipelines to be co-located in the same trench within or immediately adjacent to existing, upgraded, or proposed roads and pipelines. Fifty feet of disturbance width is proposed to install the gathering pipelines. Total short-term disturbance for the pipeline installation is estimated at 132.76 acres. North of the Horseshoe Canyon Unit, Black Hills proposes to install 1.14 miles of buried fresh water supply pipeline within a disturbance width of 50 feet (6.29 acres). All pipeline disturbances would be fully reclaimed after construction was completed.

Black Hills proposes to install 19.04 miles of temporary fresh water supply pipeline to deliver water for drilling and completion to the Winter Flats Unit and to the Wagon Track Non-Unitized Area. The pipeline would be installed on the surface along an existing road and a maximum 50 foot width is proposed for installation. Most of the surface water line route would be on BLM lands, outside of unit boundaries, so it would require a right-of-way grant from the BLM.

## Map 2.2-2

**Proposed Action Access Routes**

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**Centralized Facilities.** Black Hills proposes to centralize facilities for gas compression and for storage of fresh and produced water, all on private lands. One existing centralized water storage facility would be used, near the Homer Deep Unit (pad HDU CF#1). Four more centralized facilities are proposed: one near the Homer Deep Unit (pad HDU CF#2) and three near the Horseshoe Canyon Unit (pads HSC CF#1, HSC CF#2 and HSC CF#3). Construction of new centralized facilities is proposed at about 10 acres each, resulting in surface disturbance of about 38.49 acres. The locations of proposed centralized facilities are shown on Map 2.2-1. Legal descriptions and the purpose for each facility are provided in Table 2.2-4.

**Table 2.2-4**
**Existing and Proposed Centralized Facilities**

| Centralized Facility | T | R | Sect. | Qtr/Qtr | Purpose |
|---|---|---|---|---|---|
| HDU CF#1 (existing) | 8S | 98W | 11 | NWSE | Fresh water storage |
| HDU CF#2 (proposed) | 8S | 98W | 7 | SWSE | Compression<br>Fresh water storage<br>Produced water storage |
| HSC CF#1 (proposed) | 9S | 97W | 15 | NENW | Compression<br>Produced water storage |
| HSC CF#2 (proposed) | 9S | 97W | 35 | SWNE | Produced water storage |
| HSC CF#3 (proposed) | 9S | 97W | 9 | NWSW<br>SWNW | Fresh water storage |

### 2.2.1.2 Water Supply and Storage, Use and Disposal

Water Supply and Storage. Black Hills would purchase 500 acre-feet of water rights from the Colorado River Water District annually for the life of the project. Multiple extraction points for water supply are proposed including Latham Ponds, the Colorado River, Dry Fork and Roan Creek. Future supply locations might include Larkin Ditch, private sources and recycled produced water. Special procedures for water extraction in critical habitat for the Colorado River endangered fish are specified in the Biological Resources Protection Plan (Appendix E).

Water would be pumped via pipelines from the extraction points to centralized fresh water storage facilities. Fresh water storage located at HDU CF#1 and #2 near the Homer Deep Unit would supply drilling and completion water to proposed wells in the Homer Deep Unit. Fresh water for the Horseshoe Canyon Unit would be stored at pad HSC CF#3 to be delivered to wells in the unit via pipeline. Fresh water for drilling wells in the Wagon Track Non-Unitized Area and the Winter Flats Unit would be delivered to the well pads via temporary surface water pipeline from the extraction point to the well pad.

Water Use. Water usage for drilling and completion would be determined by the length of the horizontal section of the well bore and by the number of hydraulic fracturing stages required for economic recovery of resources. Water requirements would likely range between 200,000 barrels (25.77 acre-feet) and 500,000 barrels (64.44 acre-feet) per well for both drilling and completion. Assuming an average of 350,000 barrels per well, a total of 14,700,000 gallons (1,082.70 acre-feet) of water would be required to drill and complete 24 wells over the 3-year period.

All proposed pipelines would be hydrostatically tested for leakage using fresh water. About 0.031 barrels of water per foot of 8-inch pipe would result in a use of approximately 500,000 gallons (1.53 acre-feet). Water for dust control is estimated at 4,200 gallons per well or centralized facility, for a total of 67,200 gallons (0.21 acre-feet). Water would be applied as necessary. Total water use over the construction period of 3 years would result in an average annual depletion from the Upper Colorado River Basin of about 361.48 acre-feet.

Water Disposal. Black Hills estimates that produced water production would be 10 barrels per day per well. Black Hills would dispose of produced water deemed unacceptable for recycling in their existing Hancock Gulch #1 injection well located in the Homer Deep Unit. In the Homer Deep Unit, produced water would be gathered by buried pipelines and collected at an existing water collection site. It would then either be trucked or delivered via pipeline to the Hancock Gulch #1 injection well for disposal. In the Horseshoe Canyon Unit, produced water would be gathered with buried pipelines and delivered to HSC CF#1 or HSC CF#2 for storage, then trucked to the Hancock Gulch #1 injection well for disposal. In the Winter Flats Unit and the Wagon Track Non-Unitized Area, produced water would be stored in tanks at the producing well locations and trucked to the Hancock Gulch #1 injection well for disposal. Black Hills proposes that all produced water would be disposed of in the Hancock Gulch #1 injection well, but, instances might arise when produced water would be trucked to Danish Flats near Cisco, Utah. This would not be done on a routine basis, and requirements of Onshore Oil and Gas Order No. 7 would be followed.

#### 2.2.1.3 Schedule

Exploratory drilling is expected to include the construction of 12 well pads and the drilling and completion of 24 wells over a 3-year period. The rate of the exploratory drilling would depend largely on factors such as advances in technology and economics-based factors such as the productivity of the wells, the price of natural gas and the cost of services. Construction would begin once all approvals and permits were obtained and with consideration of all timing limitations for sensitive resources. Construction is proposed to begin in the spring of 2013.

#### 2.2.1.4 Workforce

The Proposed Action would have a peak construction workforce of 151 workers during the first three years as well pads are constructed and wells are drilled and completed. Once all wells are drilled and completed, the additional operational workforce would be about four workers including pumpers, maintenance workers and produced water truck drivers (see Table 2.2-5). Approximately 50 percent of the construction workforce and all of the operational force would be local.

**Table 2.2-5**
**Peak Construction and Operations Workforce[1]**

| Workforce Category | Number of Workers |
|---|---|
| **Construction** | |
| Well pad construction[2] | 4 |
| Well drilling[3] | 65 |
| Well completion[4] | 50 |
| Reclamation (interim) | 2 |
| Road/pipeline construction | 30 |
| **Drilling/Completion Total** | **151** |
| **Operations** | |
| Pumpers[5] | 1 |
| Maintenance[6] | 1 |
| Produced water truck drivers[7] | 2 |
| **Operation Total** | **4** |

[1] Peak workforce would occur within the first three years when well pads are being constructed and wells are being drilled and completed.
[2] Black Hills estimates one 3 to 4 man crew working 7 to 10 days on well pad construction. Assumes one well pad being constructed at any one time.
[3] Assumes two drilling rigs operating at any one time. Crews would work 24 hrs/day).
[4] Assumes one completion operation at any one time. Crews would work during daylight hours.
[5] Assumes one pumper would visit 20 wells per day.
[6] Assumes 5 day maintenance period per well per year.
[7] Assumes two water trucks hauling produced water from well pads and centralized facilities to the disposal well.

### 2.2.1.5 Access and Traffic

Primary access to the Homer Deep Unit would be via Interstate-70, Mesa County 45 Road (Roan Creek Road), Mesa County X.5 Road, Garfield County Road 200 (North Dry Fork Road) and Garfield County Road 222 (South Dry Fork Road). Collectively, Mesa County X.5 Road and Garfield County roads 200 and 222 are also known as Dry Fork Road. Primary access to the Winter Flats Unit and the Wagon Track Non-Unitized Area is via Interstate-70, Mesa County 45, 44 and V.2 roads, and the designated truck route of 4th Street, Stewart Avenue, 3rd Street, Minter Avenue and 2nd Street in De Beque. Mesa County V.2 Road is also known as Winter Flats Road. Mesa County S Road provides continued access through the Wagon Track Non-Unitized Area. From Mesa County V.2 Road, Mesa County V.6 and O.9 roads provide continuing access through the Winter Flats Unit to connect with the Homer Deep Unit from the west. Mesa County O.9 Road is also known as Corcoran Wash Road. Primary access to the Horseshoe Canyon Unit is via Mesa County 45.5 Road (the DeBeque Cutoff) and Horse Canyon Road, which is privately owned. Map 2.2-2 shows the primary access routes to the exploration areas.

Black Hills' Transportation Plan (Appendix D) describes in greater detail access throughout each of the areas, as well as access to individual well pads and centralized facilities within each area.

**Construction.** Peak project-related traffic would occur during the first three years as well pads were constructed, drill rigs mobilized and wells drilled and completed. Rig mobilization and demobilization, expected to occur for 14 days per well, as well as the hydraulic fracturing stage of well completion have the highest vehicle requirements (see Table 2.2-6). A peak of 88 vehicle round-trips per day could occur on the 336 days during which a drill rig would be mobilized or demobilized. This peak estimate assumes that a well pad and access road/pipeline sections are under construction, one drilling rig and one completion rig are in operation, drilling and completion workers carpool and dust suppression, interim reclamation and daily deliveries are being conducted.

**Table 2.2-6**
**Estimated Peak Construction Traffic with Rig Mobilization**

| Development Phase Component | Duration (days) | Peak Vehicle Round-Trips per Day | | |
|---|---|---|---|---|
| | | Light Vehicles | Heavy Vehicles | Total Vehicles |
| Pad Construction[1] | 7 – 10 | 2 | 1 | 3 |
| Rig Mobilization/Demobilization[2,3] | 14 | 12 | 33 | 45 |
| Drilling [2,3] | 45 | 9[4] | 3 | 12 |
| Completion [2, 5] | 14 – 21 | 7[6] | 11 | 18 |
| Dust Control[7] | 59 – 66 | 0 | 1 | 1 |
| Interim Reclamation | 3 | 0 | 1 | 1 |
| Deliveries | 66 – 76 | 1 | 0 | 1 |
| Road/Pipeline Construction[8] | 4 – 7 | 5 | 2 | 7 |
| **Total Peak Development Traffic** | | **36** | **52** | **88** |

[1] Source: Black Hills, 2009.
[2] Source: Black Hills, 2013.
[3] Assumes one drill rig in operation (with 36 workers) and a second drill rig being mobilized.
[4] Assumes that drilling workers carpool with four workers per light vehicle.
[5] Assumes a peak completion workforce during hydraulic fracturing operations.
[6] Assumes that completion workers carpool with two workers per heavy vehicle and four workers per light vehicle.
[7] Assumes that a total of 67,200 gallons (1,600 barrels) of water would be required (if necessary) for dust control during construction. Assumes water is sprayed onto roads from 80-barrel capacity trucks that collect water from central collection facilities located in the Homer Deep and Horseshoe Canyon units.
[8] Based on the assumption that access roads and gas-gathering pipelines would be built concurrently. Black Hills estimates one two-man crew working 4 to 5 days to build a well's access road and one seven-man crew working 4-7 days per mile to build the gas and water pipelines.

Peak traffic on days in which a drill rig was not mobilized or demobilized and two drilling rigs were in operation could include 53 vehicle round-trips per day (see Table 2.2-7).

**Table 2.2-7**
**Estimated Peak Construction Traffic without Rig Mobilization**

| Development Phase Component | Duration (days) | Peak Vehicle Round-Trips per Day | | |
|---|---|---|---|---|
| | | Light Vehicles | Heavy Vehicles | Total Vehicles |
| Pad Construction | 7 – 10 | 2 | 1 | 3 |
| Drilling [1] | 45 | 16[2] | 6 | 22 |
| Completion | 14 – 21 | 7[3] | 11 | 18 |
| Dust Control | 59 – 66 | 0 | 1 | 1 |
| Interim Reclamation | 3 | 0 | 1 | 1 |
| Deliveries | 66 – 76 | 1 | 0 | 1 |
| Road/Pipeline Construction | 4 – 7 | 5 | 2 | 7 |
| **Total Peak Construction Traffic** | | **31** | **22** | **53** |

[1] Assumes two drilling rigs in operation with a total of 65 workers.
[2] Assumes that drilling workers carpool with four workers per light vehicle.
[3] Assumes that completion workers carpool with two workers per heavy vehicle and four workers per light vehicle.

These peak traffic volumes could occur in the Homer Deep and Horseshoe Canyon units and would not occur on De Beque town streets. Peak rig mobilization traffic could occur for 140 days in the Homer Deep Unit (10 wells) and 112 days in the Horseshoe Canyon Unit (8 wells).

With four wells, peak traffic in the Wagon Track Non-Unitized Area could include 72 vehicle round- trips per day during the 56 days of rig mobilization/demobilization. Peak traffic without rig mobilization could occur with one well being drilled and the other well in the hydraulic fracturing stage of completion, when there would be 39 vehicle round trips per day. These peak traffic volumes could occur on designated truck routes in De Beque.

With two wells, peak traffic in the Winter Flats Unit, could occur for 28 days, with 53 vehicle round trips per day (including rig mobilization and road/pipeline construction). Peak traffic throughout the remainder of construction would occur during hydraulic fracturing, with 27 vehicle round trips per day. These peak traffic volumes could occur on designated truck routes in De Beque.

Black Hills employees and contractors would follow all posted speed limits. Where no speed limit is posted, speeds on unpaved access roads or disturbed areas would not exceed 20 miles per hour.

**Operations.** Traffic during production-only phase would include one light-duty truck per day for pumper visits to the well pads and one light-duty truck for an additional maintenance worker. This traffic would continue through the life of the project, which is estimated at 20 years. To reduce truck traffic, produced water would be transported via gathering pipeline to existing and proposed centralized facilities in the Homer Deep and Horseshoe Canyon units. With an estimated water production of 10 barrels per well per day, it is estimated that the gathering lines would eliminate the need for one truck trip per day traveling inside the Homer Deep and Horseshoe Canyon units. Three truck trips per day would be required to deliver produced water from the storage areas in Homer Deep and Horseshoe Canyon units and from the producing locations in Winter Flats and Wagon Track to the Hancock Gulch #1 Injection Well.

#### 2.2.1.6 Site-Specific Resource Surveys

Black Hills has conducted and would continue to conduct the following surveys and on-site inspections prior to initiating ground-disturbing activities associated with the Proposed Action. A GIS coverage identifying the extent or status of each survey effort for the Proposed Action would be maintained to document where surveys are complete and where components or areas still require surveys.

**Land Surveys.** In 2012, P.E Grosch Construction, Inc. surveyed and staked proposed well pads, resource roads and gathering pipelines within the project area. Site grading plans for each proposed well pad are provided in Appendix G. The grading plans/survey plats reflect an approximate well pad size of 10 acres; however, well pads are now proposed to be limited to 6.8 acres or less under the Proposed Action. The land surveyor considered sensitive resources identified during pre-disturbance survey efforts, if available.

**On-Site Inspections.** Onshore Oil and Gas Order No. 1 requires the BLM to conduct on-site inspections of proposed locations with operators submitting APDs. On-site inspections were conducted on July 24, 2012 for the following proposed well pads: HDU 17-43, HDU 9-11, HDU 9-41, HDU 7-23 and WF 10-31-99. At that time, additional measures were identified on location to improve design and/or minimize impacts to resources at each site.

BLM resource staff and Black Hills would conduct on-site inspections and develop any site-specific measures necessary for the other locations proposed in the DeBeque Exploratory Proposal at the time an APD is submitted to the BLM for any of the locations, to verify that sensitive resources have been avoided and to identify any needed changes or mitigation measures. No surface-disturbing activities would occur until the BLM permitted it by signing the APD.

During the on-site inspection of proposed well pad WF 10-31-99, the BLM requested that Black Hills consider shifting and rotating the pad to the east to move it out of a sagebrush area. The Pine Ridge fire had just destroyed much of the area's sagebrush communities. After looking further into this, the BLM determined that major man-made drainage structures that had been constructed to fill watering holes for wildlife and livestock would have been damaged by pad construction. The BLM concluded that the initially proposed location was acceptable.

Changes discussed at other well pads were agreed to by both parties and would be carried forward in the APDs for those locations should the Proposed Action be approved. Several of the changes are provided in Section 3.2.4.2, Surface Water Quality.

The following issues were common to all proposed well pads and included in the designs and survey plats/grading plans for these pad locations (Appendix G):

- Storm water BMPs would be designed and applied to meet the need of site-specific conditions and included in APD submission. Disturbance boundaries, incorporating all construction, soil storage and BMPs would be drawn on the plans and staked on the ground before construction. This is a standard requirement of the GJFO of the BLM.

- Storm water BMPs would be designed to handle at least a 25-year storm event.

Roads are proposed by Black Hills to be upgraded to be all weather roads to prevent road damage and avoid work stoppages when road-surface soils became saturated.

**Cultural Surveys.** A Class III (intensive) cultural resources inventory was conducted by Grand River Institute under BLM Antiquities Permit No. C-52775. Carl Conner served as Principal Investigator. Overall, the inventory consisted of 13 proposed well pads, five centralized facilities, (844 acres) and about 47 miles of linear routes (1,146 acres) for a total of 1,990 acres. Of that, 341 acres (86 block acres and 255 linear acres) were eliminated due to private landowner issues and previously surveyed areas. Areas surveyed for cultural resources included 757 block acres and about 892 linear acres for a total of 1,649 acres (1,083 BLM, 566 Private). Survey areas consisted of 40 acre blocks for pads/facilities and 200 foot corridors for pipeline and road upgrades. Several survey areas were expanded to accommodate changes to pipeline alignments and pad/facility locations.

A pre-field check in and files search occurred on March 21, 2012 and field work was performed from March 28 through September 29, 2012. Literature reviews of known cultural resources in the project area were made through the BLM GJFO and the Colorado Historical Society's Office of Archaeology and Historic Preservation (OAHP).

**Biological Surveys.** On all BLM Lands and on private land where survey permission was granted (survey permission denied from Chevron, Koehler, Counts, Callander, Riggle and Kitchen), WestWater Engineering conducted surveys from 2009 through 2012 for the following biological resources within the project area: 1) federally-listed and BLM-sensitive botanical species and/or habitat; 2) nesting raptors; 3) BLM-sensitive animal species; 4) Birds of Conservation Concern (BCC) occurrences, nest sites and habitat; 5) noxious and invasive weed species; and 6) potential U.S. Army Corps of Engineers (USACE) Waters of the U.S (WoUS), including wetland areas. BLM-sensitive and federally-listed botanical species, with the exception of DeBeque phacelia, were generally surveyed during their flowering period within a 100-meter buffer of proposed linear features (roads, pipelines) and 200-meter buffer of proposed well pad and centralized facility locations. Potential DeBeque phacelia habitat and/or plants were surveyed for on Shire and Atwell Gulch members of the Wasatch Formation within 200 meters of linear features and 300 meters of proposed well pads and centralized facilities. Raptor surveys were conducted within 0.25 mile and 0.5 mile of project features within woodland and cliff habitat, respectively, during the nesting season. Noxious weeds were surveyed within 100 feet of project features. Potential USACE jurisdictional areas were recorded when encountered along the proposed alignments and within the well pads and centralized facilities. During all survey efforts, BLM-sensitive wildlife species and/or sign were documented. Surveys were conducted according to current BLM GJFO protocol.

#### 2.2.1.7 Construction Techniques

**Well Pads.** The proposed well pads would be constructed from native soil and rock materials present using a bulldozer, grader, front-end loader, or backhoe. The pad would be constructed by clearing vegetation, stripping and stockpiling topsoil and leveling the pad area using cut-and-fill techniques. The tops of the cut banks and pad corners might be rounded to improve their appearance. Temporary storm water controls would be installed on the drilling pad. Once drilling and completion were finished and following interim reclamation, long-term disturbance associated with the well pad would be about 3.0 acres, to accommodate well production. This long-term disturbance would remain until the well was abandoned and the site underwent final reclamation. Long-term storm water controls/BMPs would be installed on the production pad.

The BHDEP and the site grading plans/survey plats for well pads (Appendix G) include disturbance of up to 10 acres for two wells. However, under the Proposed Action, well pads would not exceed 6.8 acres. Should exploratory wells prove productive, well pads could be expanded in the future up to 10 acres in order to accommodate additional wells. Black Hills has determined well pad sizes and locations based on proximity to proposed centralized gathering

and processing facilities and use of existing well pads, while decreasing the total number of well pads required.

Well pad sizes as large as 6.8 acres would be required for large rigs drilling horizontal wells, as well as advanced completion techniques requiring additional surface equipment and water storage. The pad size also provides for personnel safety in an area of complex operations and large moving equipment.

**Drilling and Completion.** Black Hills would comply with the BLM GJFO Standard COAs for Drilling, Testing and Completion. Production results from the initial wells would be used to plan future drilling. Fewer wells might be drilled due to geologic and market uncertainties.

Drilling would be conducted in compliance with all Federal Onshore Oil and Gas Orders, as well as all other applicable rules and regulations. The target zone for the wells would be from true vertical depths of approximately 1,500 to 9,000 feet in the Mesaverde, Rollins, Cozzette, Corcoran, Frontier, Sego, Mancos, Dakota and Cedar Mountain sandstones.

Black Hills proposes to use a closed loop drilling system. A fluids pit (100 feet x 250 feet) with an approximate capacity of 32,500 barrels would support drilling and completion of the wells. The fluids pit would initially contain fresh water for drilling and completion and be continually refilled with fresh water while needed. During completion, flowback fluids from hydraulic fracturing operations would be introduced and contained in the fluids pit. The flowback water would undergo separation at the surface to remove hydrocarbons and prevent introduction of them into the fluids pit. Any hydrocarbons (oil, condensate, paraffin, diesel, etc.) introduced into the pit would be removed within 24 hours of discovery.

It is estimated that initially the flowback fluids (before evaporation) would contain about 3,500 ppm of total dissolved solids (TDS). The concentration of solids in the fluid would increase as water evaporated. The fluids pit would be double lined, with both liners a minimum of 24 mil thick and they would be installed in accordance with Colorado Oil and Gas Conservation Commission (COGCC) regulations as well as the BLM GJFO Standard COAs. The pit liner would be maintained in good working condition, with no tears or holes, until the pit was closed.

The pit would be constructed to preclude the accumulation of precipitation runoff and maintain at least 2 feet of freeboard between the maximum fluid level and the lowest point of containment. If pit fluids threaten to rise to a level above that, Black Hills would immediately prevent introduction of additional fluids until sufficient pit capacity has been restored through fluid removal or installation of an alternative approved containment method.

All four sides of the fluids pit would be fenced as soon as the pit is constructed. The fencing would be 8-foot woven wire fence with adequate bracing. The bottom 2 feet of mesh would be sized adequately to preclude small animals from entering the pit. All corners would be braced and fence construction would be on cut or undisturbed ground. The fence would be maintained in good condition to exclude wildlife and livestock. The fluids pits would be netted with a maximum mesh size of 1 ½ inches. If a fluids pit is used only for fresh water, Black Hills would contact the BLM to determine if netting is necessary, on a case-by-case basis.

If the pit was lined, or constructed with a slope steeper than 3:1, anchored escape ramps would be installed every 50 feet along the pit slope and at each corner. Black Hills would immediately report any wildlife or birds found dead or apparently ill in or near the fluids pit to the BLM GJFO.

The fluids pit would be dry prior to soil testing and backfilling and would be closed per COGCC regulations. Before backfilling, the impervious pit liner would be removed and disposed of properly. Liquids and solids collected on/in the liners would not be allowed to come into contact with the pad surface, parent soil, or any other earthen layers during site cleanup. The liner would be properly cleaned prior to removal or removed in such a manner so as not to allow liquids/solids to escape. During backfilling, all mud and associated solids would be confined to the pit, with none squeezed out or incorporated into surface materials. A minimum of 4 feet of cover (overburden) would be placed above any muds or solids. The pit area would support the weight of heavy equipment without subsidence.

Surface casing would be run to a minimum depth of 50 feet below any freshwater aquifers known to be located within one mile of the proposed well. The surface hole would be cased with steel casing and cemented in place entirely from ground level to the depth as determined in the individual APD. Prior to drilling below the surface casing, a Blowout Preventer (BOP) would be installed on the surface casing and both the BOP and the surface casing would be tested for pressure integrity. The BOP and related equipment would meet the minimum requirements of Onshore Oil and Gas Order No. 2. The BLM would be notified in advance of all pressure tests.

After drilling the hole to its final depth, logging tools would be run into the well to evaluate the potential hydrocarbon resource. If the evaluation indicated adequate hydrocarbon resources were present and recoverable, steel production casing would be run and cemented into place in accordance with the well design as approved by the BLM. The proposed casing and cementing program would be designed to protect and/or isolate all usable water zones, potentially productive zones, lost circulation zones, abnormally pressured zones and any prospectively valuable deposits of minerals. BLM approval is required prior to the use of any isolating medium other than cement.

After production casing has been cemented in place, the drilling rig would be removed and a completion rig would be moved in. Well completion would consist of running a Cement Bond Log to evaluate cement integrity and to correlate the cased hole logs to the open hole logs. The casing would then be perforated across the hydrocarbon producing zones and the formation would be stimulated to enhance the production of oil and gas. The typical method used for stimulation consists of a hydraulic fracture treatment in which sand and non-toxic fluids are pumped into the producing formation with sufficient pressure to fracture the rock formation, allowing the sand grains to prop the fractures open so reservoir fluids can move more efficiently into the well bore. Specific directional plans for each well would be included in the APD. Tools would be used downhole to facilitate proper direction and path of the well.

A well is anticipated to require about 45 days to drill and between 14 and 21 days to complete. Water for drilling and completion would be pumped to locations via pipelines as described in Section 2.2.1.2, above.

**Roads and Gathering Pipelines.** Roads and pipelines would be located away from defined drainages where possible. In areas where construction was located within 100 feet of a drainage, an adequate vegetative buffer, artificial buffer (e.g., straw bales, matting, etc.), or filter strip would be maintained between the constructed feature and the drainage, to minimize sediment transport into the drainage. Any construction at perennial, intermittent and ephemeral drainage crossings (e.g. burying pipelines, installing culverts) would be timed to avoid high flow conditions.

Roads would be constructed to meet standards for the anticipated traffic flows and all-weather requirements. The proposed roads would be crowned or sloped, drained with ditches, culverts

and/or water dips and constructed, sized and surfaced in compliance with BLM Gold Book standards (BLM and Forest Service, 2007). Water outlets would incorporate BMPs such as rip-rap, sediment catchments and anchored check structures to slow water velocity and prevent erosion and sediment transport. If applicable, initial road gravel application would be to a minimum depth of 4 inches.

All proposed gathering pipelines would be constructed within or immediately adjacent to existing, upgraded, or proposed roads, generally along the uphill side of the road. Excavated topsoil would be windrowed separately from the underlying subsoil and stored along the road until the trench was backfilled. All pipelines would be buried to a minimum depth of 4 feet from surface to top of pipe. The pipeline trench would be excavated mechanically; pipe segments would then be welded together and tested, lowered into the trench and covered with excavated material. All pipeline welds within 100 feet of a perennial stream would be x-rayed to prevent leakage into the stream. Generally, 1 mile of pipeline would be constructed in 4 to 7 days.

Black Hills would install pipeline warning signs permanently marked with emergency contacts and purpose (product) of the pipeline within 5 days of construction completion and prior to use of the pipeline. Pipeline warning signs would be placed at all road crossings and along the alignment visible from sign to sign.

**Compression.** Under the presumption of successful wells, Black Hills would require two potential compression sites: one near the Homer Deep Unit and one in the Horseshoe Canyon Unit where pipelines would tie in to the existing gathering systems. Initially, compression would not be necessary because the newly drilled wells would have enough pressure to overcome the internal pressure in the gathering system. As the wells deplete, it might become necessary to install compression to allow full reservoir production. Well performance would be evaluated and the third party gas gathering company would dictate the amount of compression and horsepower (hp) required to allow the wells to flow into the gas sales pipeline. Current estimates are that a total of 6,000 hp would be required. In addition to compressors, based on quality of gas, treatment facilities might become necessary to meet third party gas pipeline specifications. Treatment equipment might include dehydration, dew point control and carbon dioxide removal. Potential locations for compression are HDU CF#2 near the Homer Deep Unit and HSC CF#1 near the Horseshoe Canyon Unit.

**Centralized Facilities.** Similar to well pad construction, the centralized facilities would be constructed from the native soil and rock materials present using a bulldozer, grader, front-end loader, or backhoe. The sites would be constructed by clearing vegetation, stripping and stockpiling topsoil and leveling the area using cut-and-fill techniques.

#### 2.2.1.8 Special Construction Techniques

**General.** In accordance with the BLM GJFO Standard COAs, construction control and limit-of-disturbance stakes would be placed before construction and maintained in place throughout. Cut and fill slopes and spoil storage would be marked with flagging, snow fence, stakes or lath, visible from one to another, in a distinctive color. All boundary markers would be maintained in place until final construction cleanup was completed. If markers were disturbed, they would be replaced before construction proceeds. Access road and pad edges would be marked by construction control stakes. Stakes would be visible from one to the next and would be staked with no more than 100-foot stationing. If stakes are disturbed, they would be replaced before construction proceeds.

Cuts and fills would be minimized when working on erosive soils and on slopes in excess of 30 percent. Cut-and-fill slopes would be stabilized through revegetation practices shortly following

construction activities to minimize the potential for slope failures, erosion and soil loss. Fill slopes adjacent to drainages would be protected with BMPs designed to minimize sediment transport.

Prior to construction, areas of approved activities would be cleared of brush and trees, which would be chipped or shredded in place, then salvaged and stored with topsoil. No stump left in place would exceed 6 inches in height. Cleared trees and shrubs which are not shredded would be salvaged and stored for later redistribution on reclaimed areas, as appropriate.

When saturated soil conditions exist, or rutting is exceeding 3 inches in depth on access roads or location, construction would be halted until soil material dries or until construction can proceed without soil damage. No saturated or frozen topsoil would be stripped.

At the time of construction, (well pads, pipelines, roads, or other surface facilities) topsoil would be stripped following vegetation removal. Topsoil would include all suitable growth medium present at a site, as indicated by color or texture – depths may vary across a site. Stripped topsoil and vegetation smaller than 4 inches in diameter would be stored separately from subsoils or other excavated material and replaced prior to final seedbed preparation.

Topsoil would be wind-rowed around the well pad perimeter, wherever practical. Along pipelines and roads, topsoil would be windrowed, segregated and sorted for later redistribution during reclamation.

Within 30 days of completion of pad construction, topsoil storage piles, storm water control features, temporarily disturbed areas along roads and pipelines, and cut and fill slopes will undergo temporary seeding to stabilize the materials, maintain biotic soil activities, and minimize weed infestations. Seedbed preparation may not be required for topsoil storage piles or other areas of temporary seeding.

**Strength Testing.** Each natural gas gathering pipeline and water line would be pressure tested with fresh water and/or nitrogen gas to locate leaks. Water would be transported to the testing location by truck or pipeline. The water would either be disposed of in the Hancock Gulch #1 injection well in the Homer Deep Unit or would be discharged to an upland area. If discharged to an upland area, the discharge location would be identified and submitted to the BLM for approval prior to discharge.

**Dust Control.** In accordance with the BLM GJFO Standard COAs, Black Hills would prevent and abate fugitive dust as needed, whether created by vehicular traffic, equipment operations, or wind events. If dust abatement was insufficient, the BLM might direct Black Hills to change the level and type of treatment. BLM approval would be required before application of surfactants, binding agents, or other dust-suppression chemicals on BLM-administered lands. More stringent dust control might be required in areas adjacent to sensitive plant species.

Black Hills estimates that approximately 4,200 gallons of water per proposed well pad/centralized facility would be required during construction. Black Hills employees and contractors would follow all posted speed limits. Where no speed limit is posted, speeds on unpaved access roads or disturbed areas would not exceed 20 miles per hour.

**Biological Resources.** Protection measures included in the Biological Resources Protection Plan (Appendix E) would be followed and implemented to minimize effects to biological resources. The protection measures include several timing limitations that Black Hills would follow, depending on species potentially affected.

#### 2.2.1.9 Production – Operation and Maintenance

Surface facilities at each well pad location would consist of wellheads, separator/dehydrator units and gas metering units. Condensate is not produced from existing wells. If condensate was encountered in the future, then three-phase separation at the wellhead would be required rather than two-phase separation and condensate tanks would be installed. Condensate would be trucked from each well pad to markets. Multi-well locations would share production equipment, whenever feasible, to minimize surface occupancy/disturbance. All production equipment with a chimney, vent or stack would be fitted with a device that would prevent birds from entering or perching above the chimney, such as an excluder cone or equivalent.

Production facilities would be located and arranged to facilitate safety and maximize interim reclamation opportunities, e.g. located at the access road end of the pad, with tanks in cut. As practical, access to production facilities would be provided by a teardrop-shaped road through the production area, so that the driving area might be clearly defined and limited and so that the teardrop center might be revegetated.

All permanent above-ground facilities placed on the well pad would be painted a natural color (or BLM Standard Environmental Color if specified by the BLM) that blends with the background landscape, in a non-reflective finish and located to avoid or minimize visibility from travel corridors, residential areas and other sensitive observation points. In cases of split estate associated with federal minerals, the surface equipment would be painted in accordance with BLM requirements unless the private surface owner requests differently.

Telemetry equipment would be used to remotely monitor wells. The use of telemetry would minimize traffic to and from the well locations to an estimated one trip per day in order to minimize impacts on wildlife and sensitive plants. A pumper truck would be required to periodically visit the well pads. The frequency of these visits would be based upon information gathered from the telemetry equipment. Between December 1 and April 30, operational traffic within sensitive big game winter habitats (winter range) would be limited to emergency traffic only within 3 hours of sunrise and sunset (between 10 a.m. and 3 p.m.). Requests for exceptions would be submitted in writing, either by letter or Sundry Notice.

All installed production facilities (storage tanks, load outs, separators, treating units, etc.) with the potential to leak or spill oil, condensate, produced water, glycol, or other fluid which might be a hazard to public health or safety would be placed within an appropriate impervious secondary containment structure that would hold 110 percent of the capacity of the largest single container within it for 72 hours. Secondary containment would consist of corrugated steel containment berms or earthen berms. Compaction and construction of earthen berms would be performed to prevent lateral movement of fluids through the utilized materials. All loading lines would be placed inside the containment berm.

Chemical containers would be clearly labeled, maintained in good condition and placed within secondary containment. They would not be stored on bare ground, nor exposed to sun and moisture.

Produced water from initial production would be confined to the fluids pit for a period of up to 90 days after initial production. Once in operation, produced water at producing well pads would be stored in tanks either at the well location or at a central storage facility (Homer Deep and Horseshoe Canyon) and trucked to the Hancock Gulch #1 injection well.

Periodically, the workover or recompletion of a well might be required to maintain efficient production. Workovers are likely to require the use of a small drill rig and may include repairs to downole well bore equipment (casing, tubing, rods, or pump), the wellhead, or the production facilities. The frequency of this type of work cannot be accurately predicted as needs vary from well to well, but activities would be subject to the same protective measures and mitigations as other project components.

#### 2.2.1.10 Abandonment and Reclamation

**Well Plugging and Abandonment.** Dry/non-producing wells would be plugged, abandoned and reclaimed within 90 days of well completion, weather permitting. Upon abandonment, each borehole would be plugged, capped and its related surface equipment removed. Subsurface pipelines would be plugged at specific intervals. A Sundry Notice would be submitted by Black Hills to the BLM describing the engineering, technical and/or environmental aspects of final plugging and abandonment. This notice would describe final reclamation procedures and any mitigation measures associated with final reclamation. The BLM and the COGCC standards for plugging would be followed. A configuration diagram, a summary of plugging procedures and a job summary with techniques used to plug the wellbore (e.g., cementation) would be included.

**Interim Reclamation.** Well pads and fluids pits could be left in place for up to 36 months, to allow water to evaporate and to evaluate the results of the exploratory well in case additional directional wells were proposed to be drilled from the pad in the near future. When a fluids pit is closed, the pad would be down-sized to the minimum size needed for long-term well production (3.0 acres). While the pit remains open and the pad full-sized, short term interim reclamation is proposed.

*Deadlines and Objectives*

- Within 30 days of completion of pad construction, topsoil storage berms, storm water control features, temporarily disturbed areas along roads and pipelines, and cut and fill slopes would undergo temporary seeding to stabilize materials, maintain biotic soil activities, and minimize weed infestations. Seedbed preparation may not be required for stored topsoil or other areas of temporary seeding.

- Within 6 months following completion of the last well planned on a pad, or after a year has passed with no new wells drilled, interim reclamation (IR) would be completed to reduce the well pad to the smallest size needed for production. IR would include earthwork, seeding and BMPs.

- IR would restore landforms; reestablish/maintain biologically active topsoil, including vegetative cover; control erosion and sediment transport; and minimize losses of habitat, visual resources, and forage throughout the life of the well.

- Prior to interim reclamation, Black Hills would meet with the BLM to inspect the disturbed area, to review the existing reclamation plan and agree upon any revisions to the plan.

- Seed tags would be submitted for BLM approval at least 14 days before proposed seeding date.

- Black Hills would notify the BLM at least 48 hours prior to beginning any reclamation work.

- Weed-free certification, seed tags, and a Subsequent Report Sundry Notice describing the reclamation would be submitted to the Grand Junction Field Office within 30 days of seeding.

- IR performance standards would be considered met when disturbed areas not needed for long-term production operations or vehicle travel have been recontoured and stabilized; and revegetated with a self-sustaining, vigorous, diverse, native (or otherwise approved) plant community that minimizes visual impacts, provides forage and stabilizes soils.

- At a minimum, the established plant community would consist of species included in the seed mix and/or desirable species which occur in the surrounding natural vegetation. Permanent vegetative cover would be determined successful when the basal cover of desirable perennial species is at least 80 percent of the basal cover of the adjacent undisturbed area or of potential basal cover as defined in the National Resource Conservation Service (NRCS) Ecological Site(s) for the area.

- Black Hills and right-of-way holders would be required to meet reclamation performance standards. Successful compliance with standards is determined by the BLM. If revegetation is unsuccessful, subsequent treatments and reseedings would be required until standards are met.

*Recontouring and Seedbed Preparation*

- Leaving in place only the areas needed for production, the fill slope soils would be pulled up and returned to cut areas, pushing up and over the edges of the cut. Compacted areas to be reclaimed would be ripped in two passes at opposite directions before being reshaped (at least 18 inches deep, furrows spaced at 2 feet).

- Following final contouring, salvaged topsoil would be evenly distributed. The BLM may require soil amendments. Final seedbed preparation would consist of scarifying (raking or harrowing) or roughening spread topsoil prior to seeding, unless seeding takes place immediately. Seedbed preparation techniques may include pocking, ripping, disking, or other soil roughening techniques. If contour cultivating is approved, it would be 4 to 6 inches deep or to the depth of redistributed topsoil. If pocking, the surface would be pitted with small depressions to form micro-basins, in a "fish scale" pattern. These would be constructed along the contour, perpendicular to the natural flow of water and/or prevailing wind.

*Seed Mixture*

The proposed seed mix, developed in coordination with the BLM and CPW, (see Table 2.2-8), is made up of palatable native species desirable to wildlife and includes grasses, shrubs and forbs.

**Table 2.2-8**
**Seed Mixture for Reclamation/Revegetation on BLM-Administered Lands**

| Common Name | Scientific Names | Variety | Season | Form | PureLiveSeed (PLS) lbs/acre* |
|---|---|---|---|---|---|
| **Grasses** | | | | | |
| Bottlebrush Squirreltail | *Elymus elymoides, Sitanion hystrix* | Toe Jam Creek | Cool | Bunch | 2.0 |
| | | | | | |
| Slender Wheatgrass | *Elymus trachycaulus, Agropyron trachycaulum* | Revenue, Pryor | Cool | Bunch | 3.0 |
| Western Wheatgrass | *Pascopyrum smithii, Agropyron smithii* | Barton, Rodan, Rosana, Arriba, Walsh | Cool | Sod-forming | 4.8 |
| Indian Ricegrass | *Achnatherum hymenoides, Oryzopsis hymenoides* | Nezpar, Paloma, Star Lake | Cool | Bunch | 2.8 |
| Junegrass | *Koeleria cristata, Koelaria macrantha* | | Cool | Bunch | 0.1 |
| **Forbs** | | | | | |
| Blue Flax | *Linum lewisii* | Maple grove | | | 0.5 |
| Northern sweetvetch | *Hedysarum borale* | Timp | | | 0.5 |
| Palmer Penstemon (**OR** Rocky Mtn Pen) | *Penstemon palmerii Penstemon strictus* | VNS** VNS | | | 0.5 |
| Small Burnet | *Sanguisorba minor* | Delar | | | 1.0 |
| Western Yarrow | *Achillea millefolium [occidentalis]* | | | | 0.1 |
| **Shrubs** | | | | | |
| Four-wing saltbush | *Atriplex canescens* | | | | 2.0 |
| Shadscale | *Atriplex confertifolia* | | | | 1.5 |
| Winterfat | *Krascheninnikovia lanata, Ceratoides lanata* | | | | 0.5 |
| Antelope bitterbrush | *Purshia tridentate* | VNS | | | 1.0 |
| **TOTAL Pure Live Seed per acre** | | | | | **20.3** |
| **Based on 80 pure live seeds (PLS) per square foot, broadcast-seeded. No hydroseeding.* | | | | | |
| *** Variety Not Specified* | | | | | |

*Seeding Procedures*

- Seeding would be conducted no more than 24 hours following final seedbed preparation. If interim revegetation is unsuccessful, Black Hills would implement subsequent reseedings until interim reclamation standards are met.

- Where possible, drill seeding ½ inch deep would occur, following the contour of the site. Drill seeding would be followed by culti-paction or crimped weed-free straw mulch, to enhance seed-to-soil contact and prevent loss of seeds and soil. In areas that cannot be drilled, broadcast seeding would occur at 2.0 times the application rate, within 24 hours of soil work. If seeding takes place later than within 24 hours of dirt work, the seed would

be covered ½ to 1 inch deep with a harrow or drag bar, unless pocking. When pocking is used as seedbed preparation, seed would be broadcast within 24 hours of soil prep.

*Erosion Control*

- Cut-and-fill slopes would be protected against erosion with the use of pocking/pitting, lateral furrows, hydromulch or other measures approved by the BLM. Near drainages or in areas with high erosion potential, additional revegetation, BMPs or methods may be required, to reduce soil erosion and off-site transport of sediments.

*Fencing and Site Protection*

- The pad would be fenced to BLM standards to exclude grazing livestock for the first two growing seasons or until seeded species are firmly established, whichever comes later. The BLM would approve the type of fencing.

- In deer and elk habitat, fences for livestock exclusion would not exceed 40 inches. The four-strand fence would have smooth top and bottom wires. Distance from the ground to the bottom smooth wire would be no less than 16 inches. Distance from the top wire to the second wire would be no less than 12 inches. Middle wires would be barbed, with 6 inch spacing.

*Monitoring*

- Black Hills would regularly monitor, for reclamation success and for invasive species, all sites categorized as "operator reclamation in progress" and would submit an annual monitoring report of these sites to the BLM by December 1 of each year. The annual report would document whether attainment of reclamation objectives appears likely. If objectives appear unlikely to be achieved, the report would identify appropriate corrective actions. Upon review and approval of the report by the BLM, Black Hills would be responsible for implementing approved or specified measures.

**Final Reclamation.** The long-term objective of final reclamation is to return the land, following use for energy development, to a condition approximating that which existed prior to disturbance. This includes restoration of the landform and natural vegetative community, hydrologic systems, visual resources, and wildlife habitats.

A well pad that no longer has a producing well would undergo final reclamation within no more than 1 year following plugging and abandonment of the final well on that pad. Buried pipelines would be reclaimed to final reclamation standards at the time of installation.

Prior to final reclamation of the well pad, Black Hills would meet with the BLM to inspect the disturbed area, review the existing reclamation plan and agree to any changes to the plan.

Black Hills would notify the BLM at least 48 hours prior to commencing any reclamation work and within 48 hours of completion of reclamation work.

Prior to recontouring and reseeding the well pad, Black Hills would complete the following:

- All equipment, facilities and trash would be removed from the location.
- Each borehole would be plugged, capped and its related surface equipment removed.
- Subsurface pipelines would be purged and plugged at specific intervals.
- Dry hole markers would be subsurface, to prevent their use as perching sites by raptors.

Recontouring for final reclamation would consist of returning the pad, material storage piles, cut-and-fill slopes and storm water control features to natural contours that blend with adjacent undisturbed areas, as specified in the final reclamation plan or final reclamation plat approved by the BLM.

Requirements for seedbed preparation, soil amendments, seed, seeding procedures, mulching, erosion control, fencing, security and monitoring would be as specified for interim reclamation.

#### 2.2.1.11 Special Design Features and Protective Measures

Black Hills has incorporated the design features and protective measures into the Proposed Action to minimize and/or avoid impacts to resources in addition to the BLM GJFO's Standard COAs. These measures are considered in the analysis of the Proposed Action:

**Air Quality.** Black Hills would use drilling rig engines that are Tier 2 compliant to minimize emissions. Tier 2 engines reduce nitrogen dioxide ($NO_2$) emissions by 68 percent compared to Tier 0 engines.

**Traffic.** The following design features are incorporated into the proposal to reduce traffic and impacts to other resources from traffic:

- Black Hills would implement dust control measures in accordance with the BLM GJFO Standard COAs.
- Workers would carpool to drilling locations when feasible.
- A produced water gathering system would be installed, reducing heavy truck traffic
- Existing roads would be used to the maximum extent possible and gathering pipelines would be placed adjacent to both existing and new roads to minimize disturbance.
- Remote telemetry would be used for well locations during operations wherever topographically feasible.
- Disposal wells within the project area would be used for injection of produced water, reducing the need for heavy truck traffic hauling produced water outside of the project area. Occasional truck loads might be hauled out of the project area to an approved disposal facility.
- A water supply delivery system would be developed as part of the Proposed Action reducing the number of heavy truck trips delivering water from outside the project area.
- Black Hills employees and contractors would follow all posted speed limits. Where no speed limit is posted, speeds on unpaved access roads or disturbed areas would not exceed 20 miles per hour to reduce dust.

**Wildlife.** Black Hills and CDOW (now Colorado Parks and Wildlife - CPW) prepared and signed a Wildlife Mitigation Plan in 2010 and are currently preparing a revised mitigation plan. The BLM has not been involved in these discussions. Any mitigation included in the plan when finalized may be considered by the BLM if determined by the BLM to be appropriate and relevant to this project.

Measures proposed by Black Hills to protect wildlife are addressed in the Biological Resources Protection Plan (Appendix E) of which many are in accordance with the Western Association of Fish and Wildlife Agencies (WAFWA) Mule Deer Technical team documents (Lutz, et al, 2011).

Black Hills proposes to meet with CPW and the BLM by July 1 of each year to discuss areas where Black Hills might request exceptions to timing limitations for the following winter.

**Colorado River Endangered Fishes.** Several conservation measures would protect endangered fish and critical habitats within the Colorado River including screening all pump intakes withdrawing water from designated critical habitats, placing pump intakes into faster moving water, and pumping from off-channel locations with no connection to critical habitat.

**Threatened and Endangered Plants.** The Biological Resources Protection Plan sets forth measures to minimize or avoid adverse effects to ESA-listed and BLM-sensitive plants within the project area (Appendix E). Well pads would not be located within 20 meters of documented Colorado hookless cactus nor within 100 meters of suitable DeBeque phacelia habitat. Black Hills would install gathering pipelines adjacent to existing roads or other existing pipelines to reduce disturbance and fragmentation of plant habitat and populations. In certain areas, Black Hills would install gathering pipelines within existing roads, or install pipelines on the opposite side of the road from known sensitive plant locations to minimize impacts to Colorado hookless cactus, DeBeque phacelia and other sensitive plants. Several measures are also identified that would reduce fugitive dust and effects on ESA-listed and BLM-sensitive plants within the project area during construction and operation of the project.

**Range.** In accordance with the BLM GJFO Standard COAs, damage to range improvements (fences, gates, reservoirs, pipelines, etc.) would be avoided, but if they are damaged, Black Hills would immediately repair or replace them. Where an access road bisects an existing livestock fence, a steel frame gate or a cattle-guard with a bypass gate would be installed across the roadway.

**Wetlands and Waters of the U.S.** Wetland evaluations were conducted for well pads, centralized facilities and associated components (i.e., pipelines and roads) where surveys were permitted, which identified potential wetlands and WoUS within 100 feet of proposed disturbance. If the area proposed for disturbance could not be adjusted to avoid potential wetlands, Black Hills would conduct a wetland delineation. If impacts to delineated wetlands and WoUS could not be avoided, Black Hills would obtain all necessary permits from the USACE in accordance with the BLM GJFO Standard COAs. Black Hills would implement BMPs described in their storm water management plans and avoid applying herbicides within 100 feet of wetlands and floodplains to minimize or avoid effects to drainages and wetlands. Drainages with water present that would be crossed during gathering pipeline construction would be crossed by a flume crossing technique to minimize downstream turbidity and sedimentation.

Black Hills would comply with the BLM GJFO Standard COAs regarding Jurisdictional Waters of the US, Wetlands and Riparian Zones.

**Cultural and Paleontological Resources.** Black Hills would comply with the BLM GJFO Standard Conditions as they apply to these resources.

**Storm Water/Water Quality.** All construction would be covered by a General Construction Permit for storm water discharge from the Colorado Department of Public Health and Environment (CDPHE). The Homer Deep Unit is covered under permit number COR-03D439; Horseshoe Canyon Unit is covered under permit number COR03D195; and the Winter Flats Unit and the Wagon Track Non-Unitized Area are covered under permit numbers COR-03D377 and COR-03C916, respectively. A Storm Water Management Plan (SWMP) is currently in place for each of the four areas. The plans would be updated as necessary to include all new construction. BMPs, as required by the permits and plans, would be in place before, during and after construction until the location had reached final stabilization. All other requirements of the

permits would be followed, such as the bi-weekly inspections and post-precipitation event inspections. In accordance with the BLM GJFO Standard COAs, all BMPs would be maintained in good repair and functional condition, including clean-out of sediment basins and catchments and replacement of straw wattles/bales or silt fence.

Black Hills has a Spill Prevention, Control and Countermeasure Plan (SPCC Plan) currently in place for the existing well locations in the area. The SPCC Plan would be updated to include this exploratory proposal.

#### 2.2.1.12 Monitoring

As described in the BHDEP, Black Hills would monitor the effectiveness of reclamation, weed control and measures applied to minimize/mitigate environmental impacts to resources within the project area.

**Reclamation**. To determine progress and/or success of reclamation, Black Hills would conduct annual monitoring surveys of all sites categorized as "operator reclamation in progress". An annual report would be submitted each year by December 1 until reclamation was considered successful by the BLM AO. The annual report would document whether attainment of reclamation objectives appears likely. If one or more objectives appear unlikely to be achieved, the report would identify appropriate corrective actions, such as reseeding an area. Upon review and approval of the report by the BLM, Black Hills would be responsible for implementing the corrective actions or other measures specified.

**Weeds**. As set forth in the Noxious and Invasive Weed Management Plan for Oil and Gas Operators (BLM, 2007a), Black Hills would regularly monitor and promptly control noxious weeds and other undesirable plant species. Prior to ground-disturbing activities, during construction and post-construction, Black Hills would map weed infestations, promptly control noxious weeds or other undesirable plants using methods approved by the BLM, and regularly monitor known/treated infestation and retreat, if necessary. Black Hills would provide an annual report to the BLM GJFO that identifies the extent of noxious weed infestations and treatment used to eradicate or minimize undesirable species. Reports would be provided by December 1 of each year until the BLM AO has determined that the desired level of control is achieved. Prior to the use of herbicides, a Pesticide Use Proposal (PUP) would be approved by the BLM.

**Special Status Plants**. Many BLM-sensitive and U.S. Fish and Wildlife Service (FWS)-listed plant species documented in the project area. Additional plant sites are expected to be observed during future special status plant surveys. Black Hills would monitor the viability of FWS-listed plants documented within 20 meters (Colorado hookless cactus) and 100 meters (DeBeque phacelia) of proposed surface-disturbing activities to determine if mitigation measures are sufficient to maintain the special status plants documented within the vicinity of the Proposed Action. Monitoring would occur 3 years after ground-disturbing activities. Depending on results of monitoring, mitigation measures might be evaluated and revised in coordination with the BLM and the FWS (if applicable). Black Hills would submit monitoring reports to the BLM and the FWS by December 1 of each monitoring year.

### 2.2.2 No Action Alternative

In accordance with the NEPA and CEQ regulations, which require that a No Action Alternative be presented in all environmental analyses in order to serve as a "base line" or "benchmark" from which to compare all proposed "action" alternatives, a No Action Alternative is analyzed in this EA. Under the No Action Alternative, the construction and operation of well pads, wells, roads, pipelines and centralized facilities would not occur. Oil and gas production would continue within the project area by Black Hills and other operators.

## 2.3 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL

If an alternative is considered during the environmental analysis process, but the agency decides not to analyze the alternative in detail, the agency must identify such alternatives and briefly explain why they were eliminated from detailed analysis (40 CFR 1502.14). An action alternative may be eliminated from detailed analysis if:

- it is ineffective (does not respond to the Purpose and Need for the Proposed Action);
- it is technically or economically infeasible (considering whether implementation of the alternative is likely, given past and current practice and technology);
- it is inconsistent with the basic policy objectives for the management of the area (such as, not in conformance with the RMP);
- its implementation is remote or speculative;
- it is substantially similar in design to an alternative that is analyzed; and/or
- it would result in substantially similar impacts to an alternative that is analyzed.

The WPMDP (Black Hills, 2008), described above in Section 1.1 (Background) and briefly discussed below, is not considered in this EA as an alternative. It is no longer a viable course of action, as it does not meet Black Hills' or the BLM's objectives. However, it is worth mentioning in this context, as it was considered in detail over several years and informed both Black Hills' and BLM's approaches to lessening potential project impacts from the current Proposed Action that is being analyzed in this EA.

Black Hills' current proposal, the BHDEP, has changed significantly since it was originally submitted in 2008 as the WPMDP. The WPMDP, proposed for implementation over a 5 year period, included 76 well pads with up to 104 wells, along with ancillary facilities like compressors and gas-gathering pipelines. The 104 wells of the WPMDP were to be drilled vertically, targeting the Dakota geological formation. BLM conducted public scoping and was analyzing the project when Black Hills substantially redesigned it based on new regional geological information and on evolving drilling techniques. The project was resubmitted to the BLM as the BHDEP in December 2011, effectively replacing the WPMDP. Major changes between the two proposals include the BHDEP proposing 64 fewer well pads and 80 fewer wells. Planned over 3 rather than 5 years, this Proposed Action targets the Mancos Shale Formation and proposes horizontal rather than vertical wells.

After submitting it in December 2011, Black Hills updated the original BHDEP proposal in October 2012, January 2013, and April 2013. The update in October 2012 provided additional project details. The update in January 2013 was in response to BLM internal scoping; it reduced proposed surface impacts by reducing pad disturbance areas from 10 acres each to 6.8 acres each. (Acreages calculated as "disturbance" for each pad include areas for topsoil storage, storm water management BMPs and cut/fill slopes). The 10 acre disturbance figure was used for purposes of analysis in this EA, but is no longer considered as part of the Proposed Action. The April 2013 update revised the BHDEP Transportation Plan, mainly in response to public comment and the need to discuss project access through the Town of De Beque.

# CHAPTER 3 - AFFECTED ENVIRONMENT AND EFFECTS

## 3.1 INTRODUCTION

This section provides a description of the human and natural environmental resources that could be affected by the Proposed Action and presents comparative analyses of the direct and indirect effects on the affected environment stemming from the implementation of the actions under the Proposed Action and other alternatives analyzed. This includes information compiled in the Grand Junction Resource Area RMP (BLM, 1987). Table 3.1-1 provides a list of potentially impacted resources which are analyzed in this EA.

**Table 3.1-1**
**Potentially Impacted Resources**

| Resources | Not Present on Location | No Impact | Potentially Impacted |
|---|---|---|---|
| **PHYSICAL RESOURCES** | | | |
| Air and Climate | | | X |
| Geological | | X | |
| Mineral Resources | | | X |
| Soils | | | X |
| Water (surface & subsurface, floodplains) | | | X |
| **BIOLOGICAL RESOURCES** | | | |
| Invasive, Non-native Species | | | X |
| Sensitive Species | | | X |
| Threatened or Endangered Species | | | X |
| Vegetation, Forestry | | | X |
| Wetlands/Riparian Zones | | | X |
| Wildlife | | | X |
| **HERITAGE RESOURCES AND HUMAN ENVIRONMENT** | | | |
| Cultural or Historical | | | X |
| Paleontological | | | X |
| Tribal & American Indian Religious Concerns | | | X |
| Visual Resources | | | X |
| Socioeconomic | | | X |
| Environmental Justice | | | X |
| Transportation and Access | | | X |
| Wastes, Hazardous or Solid | | | X |
| **LAND RESOURCES** | | | |
| Prime or Unique Farmlands | | | X |
| Recreation | | | X |
| Special Designations (ACEC, SMAs, etc.) | | | X |
| Wild and Scenic Rivers | | | X |
| Wilderness | | | X |
| Range Management | | | X |
| Wild Horse and Burros | | | X |
| Land Tenure, ROW, Other Uses | | | X |

Within each resource type, when applicable, definitions of the kinds of impacts are included in the evaluation of potential environmental impacts. Comparison of impacts is intended to provide an impartial assessment to help inform the decision-maker and the public. The impact analysis does not imply or assign a value or numerical ranking to impacts. Actions resulting in adverse impacts to one resource might impart a beneficial impact to other resources. In general, adverse impacts described in this chapter are considered important if they result from, or relate to, the implementation of any of the alternatives. These impacts are defined as follows:

- **direct impacts –** impacts that are caused by the action, and that occur at the same time and in the same general location as the action.

- **indirect impacts –** impacts that occur at a different time or in a different location than the action to which the impacts are related.

- **short or long-term impacts –** When applicable, the short-term or long-term aspects of impacts are described. For the purposes of this EA, short-term impacts occur during or after the activity or action and might continue for up to 2 years. Long-term impacts occur beyond the first 2 years.

Environmental impact analysis is based upon available data and literature from state and federal agencies, peer-review scientific literature and resource studies conducted in the project area.

## 3.2 PHYSICAL RESOURCES

### 3.2.1 Air Quality and Climate

#### 3.2.1.1 Current Conditions

Regional air quality is influenced by a combination of factors including climate, meteorology, the magnitude and spatial distribution of local and regional air pollution sources and the chemical properties of emitted pollutants. Within the lower atmosphere, regional and local scale air masses interact with regional topography to influence atmospheric dispersion and transport of pollutants. The following sections summarize the climatic conditions and existing air quality within the project area and surrounding region.

The project area is located in a semiarid (dry and cold) mid-continental climate regime. The area is typified by dry, sunny days, clear nights and large daily temperature changes. The nearest long-term meteorological measurements were collected at Altenbern, Colorado (1947-present) located about 10 miles north of the project area at an elevation of 5,690 feet above mean sea level (Western Regional Climate Center – WRCC, 2012).

The annual average total precipitation at Altenbern is 16.45 inches, with annual totals ranging from 9.15 inches (2002) to 24.18 inches (1985). Precipitation is fairly consistent throughout the year with average monthly precipitation ranging from 0.95 inches (June) to 1.62 inches (October).

An average of 63.4 inches of snow falls during the year (annual high 141.9 inches in 1949), with the majority of the snow distributed between November and March with peak months, December and January, averaging 15.1 and 16.5 inches, respectively.

The region has cool temperatures, with average temperature (in degrees Fahrenheit - ˚F) ranging between 10.0˚F and 36.6˚F in January to between 50.4˚F and 89.4˚F in July. Extreme temperatures have ranged from -32˚F (1963) to 104˚F (1989). The frost free period generally

occurs from June to September. Table 3.2-1 shows the mean monthly temperature ranges and total precipitation amounts.

**Table 3.2-1**
**Mean Monthly Temperature Ranges and Total Precipitation Amounts**

| Month | Average Temperature Range (˚F) | Total Precipitation (inches) |
|---|---|---|
| January | 10.2 – 36.6 | 1.29 |
| February | 16.6 – 43.0 | 1.23 |
| March | 23.5 – 53.0 | 1.42 |
| April | 29.9 – 62.3 | 1.45 |
| May | 37.4 – 72.5 | 1.50 |
| June | 43.9 – 83.3 | 0.95 |
| July | 50.4 – 89.4 | 1.24 |
| August | 49.1 – 86.1 | 1.61 |
| September | 41.1 – 77.5 | 1.54 |
| October | 31.3 – 66.3 | 1.62 |
| November | 21.2 – 49.5 | 1.30 |
| December | 12.3 – 38.1 | 1.30 |
| ANNUAL | 46.8 (mean) | 16.45 (mean) |
| Source: WRCC, 2012. | | |

Comprehensive wind measurements are collected at the Remote Automatic Weather Station (RAWS) Pine Ridge site on the north edge of the project area. To describe the wind flow pattern for the region, a wind rose for the site, for available years 2008 through 2010, is presented in Figure 3.2-1. From this information, it is evident that winds originate from the northeast over 38 percent of the time.

The frequency and strength of winds greatly affect the transport and dispersion of air pollutants. The annual mean wind speed is 5.6 miles per hour (mph). The average annual wind speed indicates the likelihood of good dispersion and mixing of any potential pollutant emissions resulting from project sources (see Tables 3.2-2 and 3.2-3).

**Table 3.2-2**
**Wind Speed Distribution, Pine Ridge, Colorado, 2008 - 2010**

| Wind Speed (mph) | Frequency (%) |
|---|---|
| 0 – 4.0 | 43.9 |
| 4.0 – 7.5 | 30.5 |
| 7.5 – 12.1 | 20.1 |
| 12.1 – 19.0 | 4.9 |
| 19.0 – 24.7 | 0.5 |
| Greater than 24.7 | 0.09 |

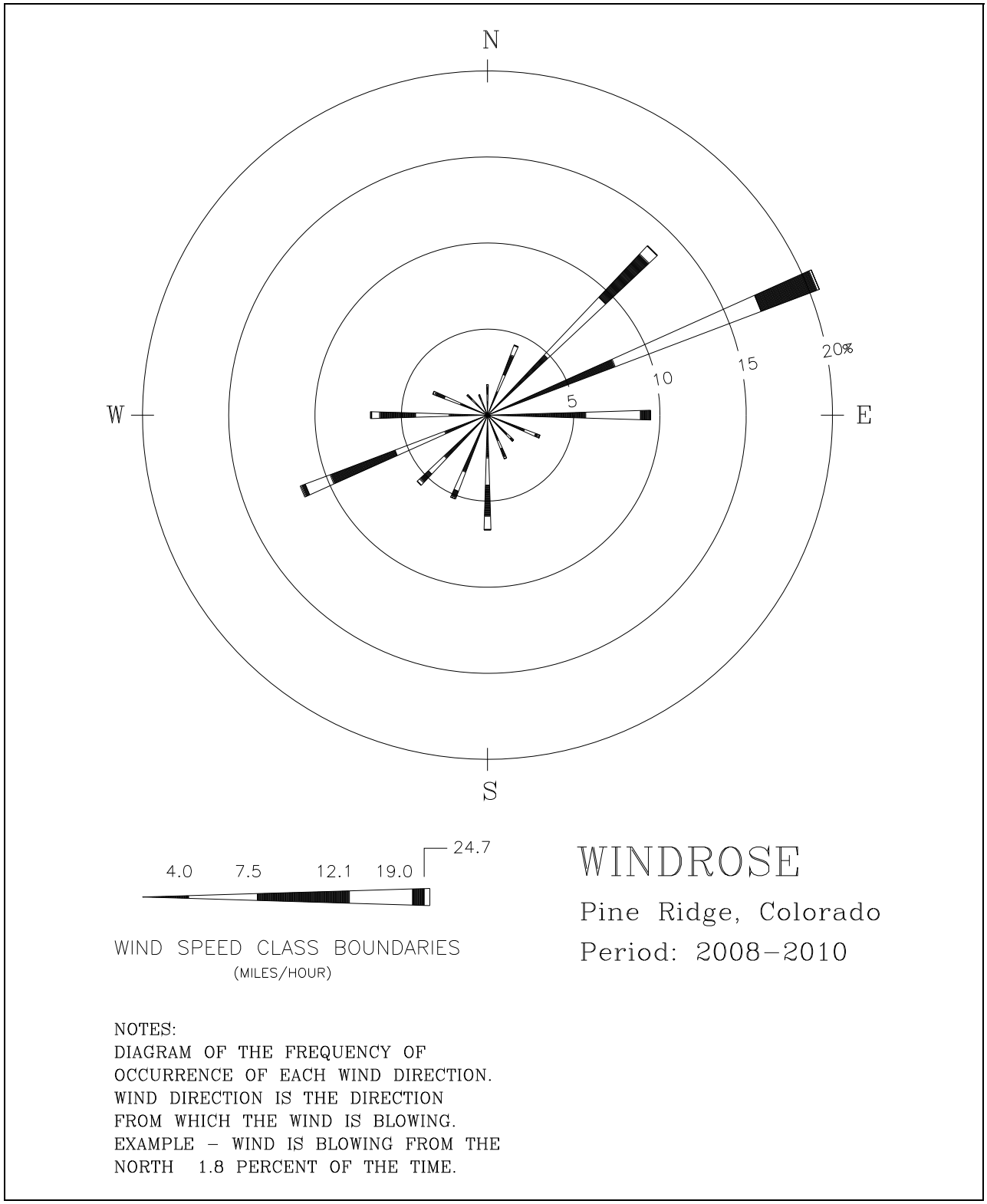


**Figure 3.2-1**
**Pine Ridge, Colorado Meteorological Data Wind Rose, 2008-2010**

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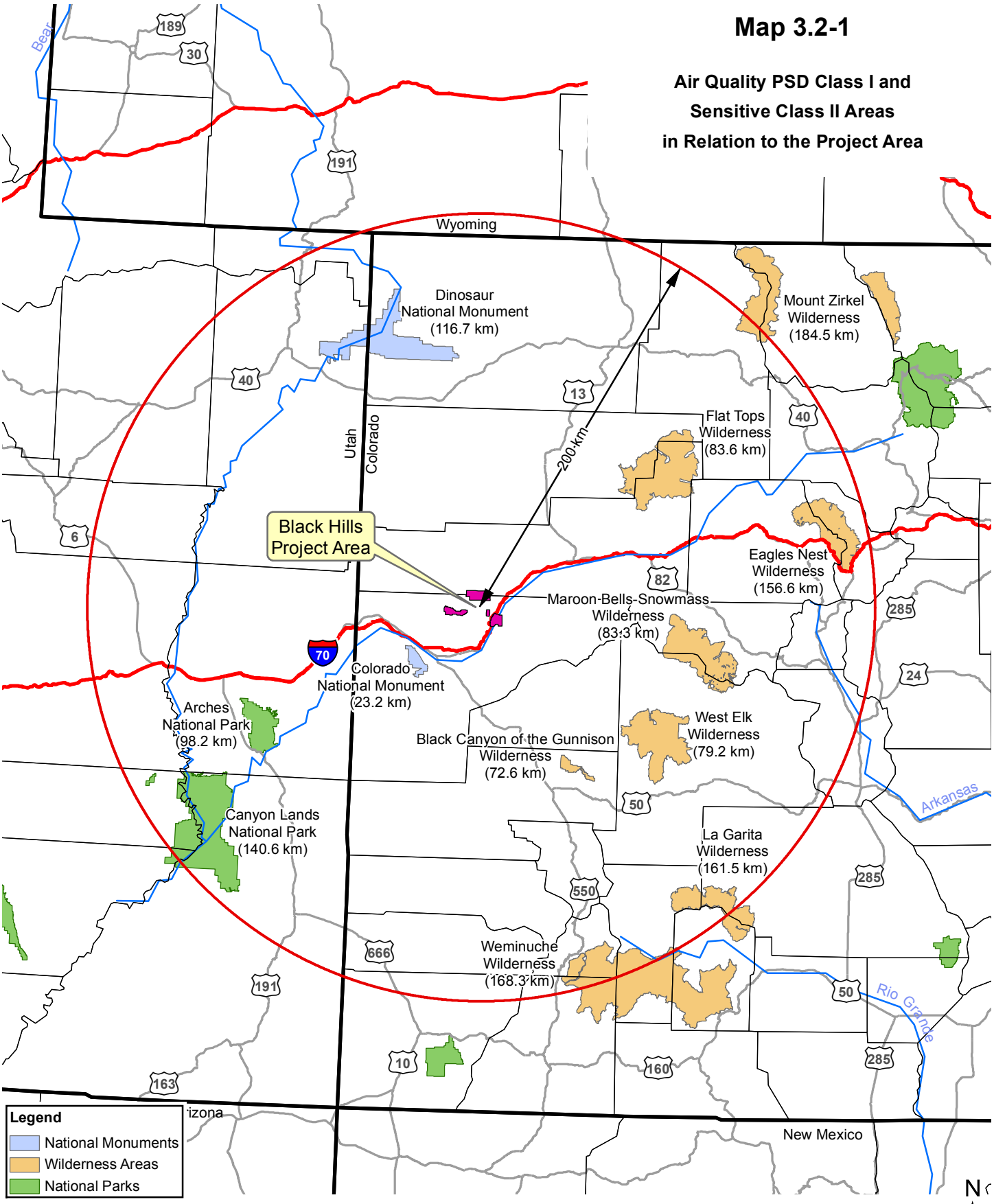
**Table 3.2-3**
**Wind Direction Frequency Distribution**
**Pine Ridge, Colorado, 2008 - 2010**

| Wind Direction | Frequency (%) |
|---|---|
| N | 1.8 |
| NNE | 4.4 |
| NE | 13.5 |
| ENE | 20.6 |
| E | 9.5 |
| ESE | 3.3 |
| SE | 2.1 |
| SSE | 2.7 |
| S | 6.7 |
| SSW | 5.2 |
| SW | 5.6 |
| WSW | 11.6 |
| W | 6.8 |
| WNW | 3.4 |
| NW | 1.6 |
| NNW | 1.3 |

**Air Pollutant Concentrations.** The U.S. Environmental Protection Agency (EPA) and the states set limits on permissible concentrations of air pollutants. The National Ambient Air Quality Standards (NAAQS) and Colorado Ambient Air Quality Standards (CAAQS) are health-based criteria for the maximum acceptable concentrations of air pollutants at all locations to which the public has access.

Monitoring of air pollutant concentrations has been conducted in the region. These monitoring sites are part of several monitoring networks overseen by state and federal agencies including: CDPHE, Clean Air Status and Trends Network (CASTNET), Interagency Monitoring of Protected Visual Environments (IMPROVE) and National Acid Deposition Program (NADP) National Trends Network (NTN).

The project area is within 200 kilometers (km) of ten PSD Class I areas and two sensitive Class II areas as shown on Map 3.2-1. Class I areas within 200 km of the project area include the Mount Zirkel Wilderness (185 km), Flat Tops Wilderness (84 km), Eagles Nest Wilderness (157 km), Maroon Bells–Snowmass Wilderness (83 km), West Elk Wilderness (79 km), Black Canyon of the Gunnison Wilderness (73 km), La Garita Wilderness (162 km), Weminuche Wilderness (168 km), Canyon Lands National Park (141 km) and Arches National Park (98 km). Federal Class II areas within 200 km of the project area that are considered sensitive areas are Dinosaur National Monument (117 km) and Colorado National Monument (23 km). Dinosaur National Monument is regulated as a Class I area for sulfur dioxide ($SO_2$) by the CDPHE.




No warranty is made by the Bureau of Land Management
for use of the data for purposes not intended by the BLM

Applicable ambient air pollutants monitored in the region include carbon monoxide (CO), nitrogen dioxide ($NO_2$), ozone ($O_3$), particulate matter less than 10 microns in effective diameter ($PM_{10}$), particulate matter less than 2.5 microns in effective diameter ($PM_{2.5}$) and $SO_2$. Background concentrations of these pollutants define ambient air concentrations in the region and establish existing compliance with ambient air quality standards. The most representative monitored regional background concentrations available for criteria pollutants as identified by CDPHE are shown in Table 3.2-4.

**Table 3.2-4**
**Background Ambient Air Quality Concentrations**

| Pollutant | Averaging Period | Measured Background Concentration µg/m$^3$ |
|---|---|---|
| CO[1] | 1-hour<br>8-hour | 1,145<br>1,145 |
| $NO_2$[2] | 1-hour<br>Annual | 92.1<br>9.4 |
| $PM_{10}$[3] | 24-hour<br>Annual | 30<br>10 |
| $PM_{2.5}$[4] | 24-hour<br>Annual | 12<br>5 |
| Ozone[5] | 8-hour | 145 |
| $SO_2$[6] | 1-hour<br>3-hour<br>24-hour<br>Annual | 31.4<br>23.5<br>13.1<br>5.2 |

[1] American Soda, American Soda, Parachute 2007-2009, CDPHE.
[2] Southern Ute, 1 mile NE of Ignacio, 2006-2008, CDPHE.
[3] Energy Fuels, 2008-2009, CDPHE.
[4] Based on S. Ute, 7571 Hwy 5505, 2009-2010, CDPHE.
[5] Based on CASTNET in Mesa Verde, Canyonlands and Gothic.
[6] 1-hour concentration data from Holcim Portland, 2007-2009, other averaging period from Unocal 1983-84 (CDPHE, 2011).

**Air Quality Related Values.** Air quality related values (AQRVs) such as visibility, atmospheric deposition and the change in water chemistry associated with atmospheric deposition at acid sensitive lakes have been identified as a concern at several Class I and sensitive Class II areas in the region.

Visibility conditions can be measured as standard visual range (SVR). SVR is the farthest distance at which an observer can just see a black object viewed against the horizon sky; the larger the SVR, the cleaner the air. Visibility for the region is considered to be very good. Continuous visibility-related optical background data have been collected in the White River National Forest IMPROVE site near the Maroon Bells-Snowmass Wilderness Area. The average SVR at the White River site is over 200 km (VIEWS, 2012).

Atmospheric deposition refers to the processes by which air pollutants are removed from the atmosphere and deposited on terrestrial and aquatic ecosystems, and it is reported as the mass of material deposited on an area per year in kilograms per hectare per year (kg/ha-yr). Air pollutants are deposited by wet deposition (precipitation) and dry deposition (gravitational settling of pollutants). The chemical components of wet deposition include sulfate ($SO_4$), nitrate ($NO_3$) and ammonium ($NH_4$); the chemical components of dry deposition include $SO_4$, $SO_2$, $NO_3$, $NH_4$ and nitric acid ($HNO_3$).

The NADP and the NTN station monitors wet atmospheric deposition and the CASTNET station monitors dry atmospheric deposition at the Gothic site, located east of the project area. The total annual deposition (wet and dry) reported as total nitrogen (N) and total sulfur (S) deposition for year 2009 are shown in Table 3.2-5.

**Table 3.2-5**
**Background N and S Deposition Values (kg/ha-yr)[1]**

| Site Location | Nitrogen Deposition | | | Sulfur Deposition | | | Year of Monitoring |
|---|---|---|---|---|---|---|---|
| | Wet | Dry | Total | Wet | Dry | Total | |
| Gothic | 1.77 | 0.23 | 2.00 | 0.89 | 0.09 | 0.98 | 2010 |

[1] EPA, 2012a.

Table 3.2-6 presents a list of nine lakes in the Flat Tops, Maroon Bells-Snowmass, Raggeds and West Elk Wilderness Areas that have been identified as acid sensitive lakes. Analyses for potential changes to lake acidity from atmospheric deposition are based on the acid neutralizing capacity (ANC) for the lake. The most recent lake chemistry background ANC data available from the Forest Service are shown in Table 3.2-6. The ANC values shown are the 10th percentile lowest ANC values which were calculated for each lake following procedures provided from the Forest Service. The years of monitoring data that were currently available and the number of samples used in the calculation of the 10$^{th}$ percentile lowest ANC values are provided.

Of the nine lakes listed in Table 3.2-6, one lake (Upper Ned Wilson) is considered by the Forest Service as extremely sensitive to atmospheric deposition because the background ANC values are less than 25 microequivalents per liter (µeq/l).

**Table 3.2-6**
**Background ANC Values for Acid Sensitive Lakes[1]**

| Wilderness Area | Lake | Latitude (Deg-Min-Sec) | Longitude (Deg-Min-Sec) | 10th Percentile Lowest ANC Value (µeq/l)[2] | Number of Samples | Monitoring Period |
|---|---|---|---|---|---|---|
| Flat Tops | Ned Wilson Lake | 39°57'41" | 107°19'25" | 39.4 | 195 | 1981-2007 |
| Flat Tops | Upper Ned Wilson Lake | 39°57'46" | 107°19'25" | 12.9 | 144 | 1983-2007 |
| Flat Tops | Lower Packtrail Pothole | 39°58'5" | 107°19'24" | 29.7 | 96 | 1987-2007 |
| Flat Tops | Upper Packtrail Pothole | 39°57'56" | 107°19'23" | 48.7 | 96 | 1987-2007 |
| Maroon Bells-Snowmass | Avalanche Lake | 39°8'33" | 107°5'53" | 170.3 | 54 | 1991-2009 |
| Maroon Bells-Snowmass | Capitol Lake | 39°9'42" | 107°4'50" | 184.2 | 54 | 1991-2009 |
| Maroon Bells-Snowmass | Moon Lake | 39°9'49" | 107°3'34" | 54.9 | 52 | 1991-2009 |
| Raggeds | Deep Creek Lake | 39°0'30" | 107°14'23" | 40.1 | 28 | 1995-2009 |
| West Elk | South Golden Lake | 38°46'39" | 107°10'58" | 112.2 | 23 | 1995-2009 |

[1] Source: Forest Service, 2010.
[2] 10$^{th}$ Percentile Lowest ANC Values reported.

**Overview of Regulatory Environment.** The CDPHE-Air Pollution Control Division (APCD) is the primary air quality regulatory agency responsible for determining potential impacts once

detailed industrial development plans have been made, and those development plans are subject to applicable air quality laws, regulations, standards, control measures and management practices. Therefore, the CDPHE-APCD has the ultimate responsibility for reviewing and permitting the project prior to its operation. Unlike the conceptual 'reasonable, but conservative' engineering designs used in NEPA analyses, any CDPHE-APCD air quality preconstruction permitting demonstrations required would be based on very site-specific, detailed engineering values, which would be assessed in the permit application review. Any facility developed under the Proposed Action which meets the requirements set forth under Colorado regulations would be subject to CDPHE-APCD permitting and compliance processes.

Federal air quality regulations adopted and enforced by CDPHE-APCD limit incremental emission increases to specific levels defined by the classification of air quality in an area. The PSD Program is designed to limit the incremental increase of specific air pollutant concentrations above a legally defined baseline level. Incremental increases in PSD Class I areas are strictly limited, while increases allowed in Class II areas are less strict. Through the PSD program, Class I areas are protected by Federal Land Managers (FLMs) by management of AQRVs such as visibility, aquatic ecosystems, flora, fauna, etc.

The 1977 Clean Air Act amendments established visibility as an AQRV that FLMs must consider. The 1990 Clean Air Act amendments contain a goal of improving visibility within PSD Class I areas. The Regional Haze Rule finalized in 1999 requires the states, in coordination with federal agencies and other interested parties, to develop and implement air quality protection plans to reduce the pollution that causes visibility impairment.

Regulations and standards which limit permissible levels of air pollutant concentrations and air emissions and are relevant to the project air impact analysis include:

- NAAQS, CAAQS;
- PSD; and
- New Source Performance Standards (NSPS).

Each of these regulations is further described in the following sections.

Ambient Air Quality Standards - The Clean Air Act requires the EPA to set NAAQS for pollutants considered to endanger public health and the environment. The NAAQS prescribe limits on ambient levels of these pollutants in order to protect public health, including the health of sensitive groups. The EPA has developed NAAQS for six criteria pollutants: $NO_2$, CO, $SO_2$, $PM_{10}$, $PM_{2.5}$, $O_3$ and lead. Lead emissions from project sources are negligible and therefore, the lead NAAQS is not addressed in this analysis. States typically adopt the NAAQS but may also develop state-specific ambient air quality standards for certain pollutants. The NAAQS and the CAAQS are summarized in Table 3.2-7. PSD Class I and Class II increments are also included in Table 3.2-7.

An area that is shown to exceed the NAAQS for a given pollutant may be designated as a nonattainment area for that pollutant. The project area is located in an area designated as attainment for all pollutants.

Hazardous Air Pollutants - Hazardous air pollutants (HAPs) are those pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects. No ambient air quality standards exist for air toxics, instead, emissions of these pollutants are regulated by a variety of regulations that target

the specific source class and industrial sectors for stationary, mobile and product use/formulations.

For the air quality analysis short-term (1-hour) HAP concentrations are compared to acute Reference Exposure Levels (RELs) (EPA, 2011) shown in Table 3.2-8. RELs are defined as concentrations at or below which no adverse health effects are expected. No RELs are available for ethyl benzene and n-hexane; instead, the available Immediately Dangerous to Life or Health divided by 10 (IDLH/10) values are used. These IDLH values were determined by the National Institute for Occupational Safety and Health (NIOSH) and were obtained from EPA's Air Toxics Database (EPA, 2011). These values are approximately comparable to mild effects levels for 1-hour exposures.

**Table 3.2-7**
**Ambient Air Quality Standards and PSD Increments (μg/m$^3$)**

| Pollutant/Averaging Time | NAAQS | CAAQS | PSD Class I Increment[1] | PSD Class II Increment[1] |
|---|---|---|---|---|
| **CO** | | | | |
| 1-hour[2] | 40,000 | 40,000 | --[3] | --[3] |
| 8-hour[2] | 10,000 | 10,000 | --[3] | --[3] |
| **$NO_2$** | | | | |
| 1-hour[8] | 188 | 188 | --[3] | --[3] |
| Annual[4] | 100 | 100 | 2.5 | 25 |
| **$O_3$** | | | | |
| 8-hour[6] | 147 | 147 | --[3] | --[3] |
| **$PM_{10}$** | | | | |
| 24-hour[2] | 150 | 150 | 8 | 30 |
| Annual[4] | --[5] | | 4 | 17 |
| **$PM_{2.5}$** | | | | |
| 24-hour[7] | 35 | 35 | 2 | 9 |
| Annual[4] | 12 | 12 | 1 | 4 |
| **$SO_2$** | | | | |
| 1-hour[9] | 196 | 196 | --[3] | --[3] |
| 3-hour[2] | 1,300 | 700 | 25 | 512 |
| 24-hour[2] | --[5] | | 5 | 91 |
| Annual[4] | --[5] | | 2 | 20 |

[1] The PSD demonstrations serve information purposes only and do not constitute a regulatory PSD increment consumption analysis.
[2] No more than one exceedance per year.
[3] No PSD increments have been established.
[4] Annual arithmetic mean.
[5] The NAAQS for this averaging time for this pollutant has been revoked by EPA.
[6] An area is in compliance with the standard if the fourth-highest daily maximum 8-hour ozone concentrations in a year, averaged over 3 years, is less than or equal to the level of the standard.
[7] An area is in compliance with the standard if the highest 24-hour $PM_{2.5}$ concentrations in a year, averaged over 3 years, is less than or equal to the level of the standard.
[8] An area is in compliance with the standard if the 98$^{th}$ percentile of daily maximum 1-hour $NO_2$ concentrations in a year, averaged over 3 years, is less than or equal to the level of the standard.
[9] An area is in compliance with the standard if the 99$^{th}$ percentile of daily maximum 1-hour $SO_2$ concentrations in a year, averaged over 3 years, is less than or equal to the level of the standard.

**Table 3.2-8**
**Acute RELs (1-Hour Exposure)**

| HAP | REL (µg/m$^3$) |
|---|---|
| Benzene | 1,300[1] |
| Toluene | 37,000[1] |
| Ethyl benzene | 350,000[2] |
| Xylene | 22,000[1] |
| n-Hexane | 390,000[2] |
| Formaldehyde | 55[1] |
| [1] EPA Air Toxics Database, Table 2 (EPA, 2011).<br>[2] No REL available for these air toxics. Values shown are from Immediately Dangerous to Life or Health (IDLH/10), EPA Air Toxics Database, Table 2 (EPA, 2011). | |

Long-term exposure to HAPs are compared to Reference Concentrations for Chronic Inhalation (RfCs). An RfC is defined by EPA as the daily inhalation concentration at which no long-term adverse health effects are expected. RfCs exist for both non-carcinogenic and carcinogenic effects on human health (EPA, 2012b). Annual modeled air toxics concentrations for all air toxics emitted are compared directly to the non-carcinogenic RfCs shown in Table 3.2-9.

**Table 3.2-9**
**Non-Carcinogenic HAP RfCs (Annual Average)[1]**

| HAP | Non-CarcinogenicRfC1 (µg/m$^3$) |
|---|---|
| Benzene | 30 |
| Toluene | 5,000 |
| Ethyl benzene | 1,000 |
| Xylene | 100 |
| n-Hexane | 700 |
| Formaldehyde | 9.8 |
| [1] EPA Air Toxics Database, Table 1 (EPA, 2012b). | |

Long-term exposures to emissions of suspected carcinogens (benzene, ethyl benzene and formaldehyde) are also evaluated based on estimates of the increased latent cancer risk over a 70-year lifetime.

Prevention of Significant Deterioration - The PSD Program is designed to limit the incremental increase of specific air pollutant concentrations above a legally defined baseline level. All areas of the country are assigned a classification which describes the degree of degradation to the existing air quality that is allowed to occur within the area under the PSD permitting rules. PSD Class I areas are areas of special national or regional natural, scenic, recreational or historic value. Little degradation in air quality is allowed by strictly limiting industrial growth. PSD Class II areas allow for reasonable industrial/economic expansion. Certain national parks and wilderness areas are designated as PSD Class I. Air quality in these areas is protected by allowing only slight incremental increases in pollutant concentrations. PSD Class I areas within 200 km of the project area are shown on Map 3.2-1. All other areas not designated PSD Class I are classified as PSD Class II, where less stringent limits on increases in pollutant concentrations apply. Sensitive PSD Class II areas are subject to PSD Class II Increments shown in Table 3.2-7.

Comparisons of project impacts to the PSD Class I and II increments are for informational purposes only and are intended to evaluate a threshold of concern. They do not represent a

regulatory PSD Increment Consumption Analysis, which would be completed as necessary during the New Source Review permitting process by the State of Colorado.

In addition to the PSD increments, Class I areas are protected by the FLMs through management of AQRVs such as visibility, aquatic ecosystems, flora, fauna, etc. Evaluations of potential impacts to AQRVs would also be performed during the New Source Review permitting process under the direction of the CDPHE-APCD in consultation with the FLMs.

AQRVs to be analyzed for the Proposed Action include visibility, atmospheric deposition and potential sensitive lake acidification, a discussion of the applicable background data and analysis thresholds are provided below.

Visibility - Change in atmospheric light extinction relative to background conditions is used to measure regional haze. Analysis thresholds for atmospheric light extinction are set forth in The Federal Land Managers' Air Quality Related Values Work Group (FLAG) Report (FLAG, 2010), with the results reported in percent change in light extinction and change in deciviews (dv). A 5 percent change in light extinction (approximately equal to a 0.5 change in dv) is the threshold recommended in FLAG (2010) and is considered to contribute to regional haze visibility impairment. A 10 percent change in light extinction (approximately equal to 1.0 dv) is considered to represent a noticeable change in visibility when compared to background conditions.

Estimated visibility degradation at the Class I areas and sensitive Class II areas of concern are presented in terms of the number of days that exceed a threshold percent change in extinction, or dv relative to background conditions. Although procedures and thresholds have not been established for sensitive Class II areas, the BLM is including these areas in its visibility analysis.

Atmospheric Deposition and Lake Chemistry - The effects of atmospheric deposition of nitrogen and sulfur compounds on terrestrial and aquatic ecosystems are well documented and have been shown to cause leaching of nutrients from soils, acidification of surface waters, injury to high elevation vegetation, and changes in nutrient cycling and species composition.

FLAG (2010) recommends that applicable sources assess impacts of nitrogen and sulfur deposition at Class I areas. This guidance recognizes the importance of establishing critical deposition loading values ("critical loads") for each specific Class I area as these critical loads are completely dependent on local atmospheric, aquatic and terrestrial conditions and chemistry. Critical load thresholds are essentially a level of atmospheric pollutant deposition below which negative ecosystem effects are not likely to occur. FLAG (2010) does not include any critical load levels for specific Class I areas and refers to site-specific critical load information on FLM websites for each area of concern. This guidance does, however recommend the use of deposition analysis thresholds (DATs) developed by the National Park Service (NPS) and the FWS. The DATs represent screening level values for nitrogen and sulfur deposition from project alone emission sources below which estimated impacts are considered negligible. The DAT established for both nitrogen and sulfur in western Class I areas is 0.005 kg/ha-yr.

The BLM has compiled currently available research data on critical load values for Class I areas in the vicinity of this project. Critical load thresholds published by Fox et al. (1989) established pollutant loadings for total nitrogen of 3 to 5 kg/ha-yr and for total sulfur of 5 kg/ha-yr for the Bob Marshall Wilderness Area in Montana and the Bridger Wilderness Area in Wyoming. However, the NPS has recently stated that these pollutant loadings are not protective of sensitive

resources and in its *"Technical Guidance on Assessing Impacts to Air Quality in NEPA and Planning Documents"*, January 2011 suggests that critical load values above 3 kg/ha-yr may result in moderate impacts. Research conducted by Baron (2006) using hindcasting of diatom communities suggests 1.5 kg/ha-yr as a critical loading value for wet nitrogen deposition for high elevation lakes in Rocky Mountain National Park, Colorado. Recent research conducted by Saros et al. (2010) using fossil diatom assemblages suggests that a critical load value of 1.4 kg/ha-yr for wet nitrogen is applicable to the eastern Sierra Nevada and Greater Yellowstone ecosystems. Project N and S deposition impacts are compared to the following critical load values: with 1.5 kg/ha-yr used as a surrogate for total N deposition and 3 kg/ha-yr used for total S deposition for Class I and Class II areas.

Analyses to assess the change in water chemistry associated with atmospheric deposition are performed following the procedures developed by the Forest Service Rocky Mountain Region (Forest Service, 2000). The analysis assesses the change in the ANC of nine sensitive lakes in the region (Table 3.2-6). Predicted changes in ANC are compared with the applicable threshold for each identified lake: 10 percent change in ANC for lakes with background ANC values greater than 25 μeq/l, and less than a 1 μeq/l change in ANC for lakes with background ANC values equal to or less than 25 μeq/l.

New Source Performance Standards – Construction and the operation of production equipment may be subject to emission limits, control requirements and recordkeeping and reporting requirements set forth in New Source Performance Standards contained in 40 CFR 63. Potentially applicable subparts include Subpart A, General Provisions and Subpart OOOO, Standards of Performance for Crude Oil and Natural Gas Production. The final determination of applicability and compliance with these federal standards, as well as Colorado oil and gas industry standards, would be made during the state permitting process.

Greenhouse Gases - The U.S. Supreme Court ruled in 2007 that EPA has the authority to regulate greenhouse gases (GHGs) such as methane ($CH_4$) and carbon dioxide ($CO_2$) as air pollutants under the Clean Air Act; however, there are currently no ambient air quality standards for GHGs, nor are there currently any emissions limits on GHGs that would apply to sources developed under the Proposed Action. As part of the development of the project emission inventory, an inventory of $CO_2$, $CH_4$ and nitrous oxide ($N_2O$) was prepared. GHGs were not modeled, but the GHG inventory is presented for informational purposes.

#### 3.2.1.2 Environmental Consequences

**Proposed Action Alternative**

**Introduction.** An air quality modeling analysis was performed to assess the impacts on ambient air quality and AQRVs from potential air emissions due to the Proposed Action. Both near-field and far-field air quality analyses were performed. Potential ambient air quality impacts were quantified and compared to applicable state and federal ambient air quality standards and PSD increments, HAP thresholds and AQRV impacts (impacts on visibility, atmospheric deposition and potential increases in acidification to acid-sensitive lakes) were determined and compared to applicable thresholds.

The Mandatory Reporting of Greenhouse Gases, 40 CFR 98, final rule (EPA, 2011) sets forth monitoring, recordkeeping and reporting requirements for certain emitters of GHGs. Subpart W of the rule is applicable to Petroleum and Natural Gas Systems and would include the Proposed Action. Subpart W does not require emission controls or establish emissions limits on GHG emissions for the Proposed Action.

EPA's Greenhouse Gas Tailoring Rule defines GHG emission levels at which an emitter would be subject to PSD permit requirements. The Tailoring Rule generally applies to new sources emitting 100,000 tons per year or more of GHGs from a single facility. The Proposed Action would emit far less than the PSD applicability threshold established under this rule and as such, the Proposed Action would not be subject to PSD permitting under this rule.

Near-Field Modeling

A near-field ambient air quality impact assessment was performed to evaluate maximum pollutant impacts within and near the project area resulting from construction and operation. EPA's Guideline model (EPA, 2005), AERMOD (version 12345), was used to assess these near-field impacts. The near-field modeling used one year of meteorological data collected during 2010 at the Pine Ridge RAWS site, located within the northern portion of the project area.

The near-field criteria pollutant assessment was performed to estimate maximum potential impacts of CO, $NO_2$, $SO_2$, $PM_{10}$ and $PM_{2.5}$ from construction and production emissions sources. Near-field HAP (benzene, toluene, ethyl benzene, xylene, n-hexane and formaldehyde) emissions were evaluated for purposes of assessing impacts in the immediate vicinity of the project area for both short-term (acute) exposure assessment and for calculation of long-term human health risk. The near-field assessment focused on the most concentrated development area within the project area, the Horseshoe Canyon Unit, for assessing impacts. The near field assessment included construction and production activities for the four well pads within the Horseshoe Canyon Unit, along with HSC CF#1 and nearby DeBeque Canyon and Wagon Track well pads. The modeling scenario included two drilling rigs and one completion rig operating continuously over a year along with the associated vehicle traffic emissions. It also included the proposed compressor at HSC CF#1. The analysis utilized a receptor grid that extended outward at least 1.5 km from the edge of any well pad and from HSC CF#1. Discrete modeling receptors were defined on a 50-meter interval along boundaries, beginning 100 meters from the edge of each well pad and from the proposed compressor located at HSC CF#1, and were then defined on 100-meter intervals throughout the modeling domain.

Far-Field Modeling

A far-field ambient air quality impact assessment was carried out to quantify potential air quality impacts to both ambient air concentrations and AQRVs from air pollutant emissions of $NO_x$, $SO_2$, $PM_{10}$ and $PM_{2.5}$ expected to result from the project. Ambient air quality impacts of $NO_2$, $SO_2$, $PM_{10}$ $PM_{2.5}$ and AQRVs were analyzed at far-field federal Class I and sensitive Class II areas located within 100 km of the project area. The Class I areas located within 100 km of the project area include the Black Canyon of the Gunnison Wilderness, Flat Tops Wilderness, Maroon Bells–Snowmass Wilderness, West Elk Wilderness and Arches National Park. Federal Class II areas within 100 km of the project area that are considered sensitive areas include the Raggeds Wilderness Area and Colorado National Monument. In addition, nine lakes that are designated as acid sensitive and are located within the Flat Tops Wilderness area (Ned Wilson Lake, Upper Ned Wilson Lake, Lower Packtrail Pothole and Upper Packtrail Pothole), Maroon Bells-Snowmass Wilderness area (Avalanche Lake, Capitol Lake and Moon Lake), Raggeds Wilderness area (Deep Creek Lake) and West Elk Wilderness area (South Golden Lake) were assessed for potential lake acidification from atmospheric deposition impacts.

The far-field analyses used the EPA-approved version of the CALPUFF modeling system (Version 5.8) along with a windfield developed for year 2008 using the Mesoscale Model Interface Program (MMIF) Version 2.1 (ENVIRON, 2012) and the 2008 Weather Research and Forecasting (WRF) meteorological model output that was produced as part of the Western

Regional Air Partnership's (WRAP) West-wide Jump Start Air Quality Modeling Study (WestJumpAQMS) (ENVIRON et al., 2012).

The far-field assessment assumed construction and production activities were occurring simultaneously throughout the project area. Two drilling rigs and one completion rig were assumed to operate continuously over the year, along with two proposed compressor sites. Emissions associated with well pad construction, well installation and well site production were also included in the analysis.

**Impact Significance Criteria.** Air quality impacts from pollutant emissions are limited by regulations, standards and implementation plans established under the Federal Clean Air Act, as administered by the CDPHE-APCD under authorization of the EPA. Under FLPMA and the Clean Air Act, the BLM cannot conduct or authorize any activity which does not conform to all applicable local, state, tribal or federal air quality laws, statutes, regulations, standards, or implementation plans. As such, significant impacts to air quality from project-related activities would result if it is demonstrated that:

- NAAQS or CAAQS would be exceeded; or
- AQRVs would be impacted beyond acceptable levels.

All NEPA analysis comparisons to the PSD Class I and II increments are intended to evaluate a threshold of concern, and do not represent a regulatory PSD Increment Consumption Analysis. The determination of PSD increment consumption is an air quality regulatory agency responsibility. Such an analysis would be conducted to determine minor source increment consumption or, for major sources, as part of the New Source Review process. The New Source Review process would also include an evaluation of potential impacts to AQRVs such as visibility, aquatic ecosystems, flora, fauna, etc. performed under the direction of federal land managers.

**Emission Inventory Development.** Emission sources would occur as part of construction and well production. Construction emission sources include vehicle traffic, well pad and road construction, pipeline construction and well drilling and completion. The primary pollutants emitted during construction would be $PM_{10}$, $PM_{2.5}$, $NO_x$, CO, $SO_2$, volatile organic compounds (VOCs) and HAPs including benzene, toluene, ethyl benzene, xylene, n-hexane and formaldehyde. These activities would temporarily elevate pollutant levels, but impacts would be localized and would occur only for the short-term duration of the activities. Fugitive dust emissions ($PM_{10}$ and $PM_{2.5}$) would result from work crews commuting to and from the work site and from the transportation and operation of equipment during construction. Wind-blown fugitive dust emissions would also occur from open and disturbed land during construction; however, water would be applied when necessary to control fugitive dust during construction and from travel on unpaved roads.

Emissions from construction were quantified using accepted methodologies, including manufacturer's emission factors, EPA emission factors and engineering estimates. Drill rig and completion engines are assumed to be Tier 2 emissions compliant. Maximum annual field-wide criteria pollutant emissions resulting from construction activities are shown in Table 3.2-10. The emissions assume that a maximum of 12 well pads are constructed in one year, and that eight wells are drilled and completed in one year.

**Table 3.2-10**
**Construction Emissions**

| Activity | Tons Per Year | | | | | | |
|---|---|---|---|---|---|---|---|
| | $PM_{10}$ | $PM_{2.5}$ | $NO_x$ | CO | $SO_2$ | VOC | |
| Well Pad and Road Construction | 19.80 | 2.00 | 4.10 | 3.00 | 0.10 | 0.40 | |
| Pipeline Construction | 28.90 | 2.80 | 1.00 | 0.80 | 0.03 | 0.10 | |
| Drill Rig Engines | 0.90 | 0.90 | 25.70 | 14.90 | 2.20 | 1.70 | |
| Drilling Traffic | 50.90 | 5.10 | 3.70 | 5.30 | 0.02 | 0.50 | |
| Completion Engines | 0.08 | 0.08 | 2.30 | 1.30 | 0.20 | 0.20 | |
| Completion Traffic | 10.80 | 1.10 | 1.40 | 1.70 | 0.01 | 0.20 | |
| Completion Venting/Flaring | 0.00 | 0.00 | 0.30 | 1.60 | 0.00 | 14.40 | |
| **Maximum Annual Emissions** | **111.38** | **11.98** | **38.50** | **28.60** | **2.56** | **17.50** | |

During production, emissions would occur from vehicle traffic on roads during routine field operations and maintenance, well site separator heaters, two proposed compressors and from workovers. The primary pollutants emitted would be $PM_{10}$, $PM_{2.5}$, $NO_x$, CO, $SO_2$, VOCs and formaldehyde. These emissions would impact air quality in the project area over the life of the project. Production equipment is subject to current and future CDHPE Best Available Control Technology (BACT) and Reasonably Available Control Technology (RACT) guidance and applicable portions of 40 CFR Part 63 Subpart OOOO, Standards of Performance for Crude Oil and Natural Gas Production. Maximum annual emissions calculated for production are summarized in Table 3.2-11.

**Table 3.2-11**
**Annual Production Emissions**

| Activity | Tons/Year | | | | | | |
|---|---|---|---|---|---|---|---|
| | $PM_{10}$ | $PM_{2.5}$ | $NO_x$ | CO | $SO_2$ | VOC | |
| Workover Rig Engines | 0.02 | 0.02 | 0.50 | 0.30 | 0.03 | 0.03 | |
| Production Traffic | 6.00 | 0.60 | 0.50 | 0.50 | 0.00 | 0.05 | |
| Separator Heater | 0.00 | 0.00 | 1.00 | 0.50 | 0.00 | 0.30 | |
| Compression Engines | 0.00 | 0.00 | 57.9 | 115.90 | 0.00 | 40.60 | |
| **Total Production Emissions** | **6.02** | **0.62** | **59.9** | **117.20** | **0.03** | **40.98** | |

Greenhouse Gases

As part of the development of the project emission inventory, an inventory of $CO_2$, $CH_4$ and $N_2O$ emissions from field development and production activities was prepared. GHGs were not modeled in either the near-field or far-field impact analyses, but the GHG inventory is presented here for informational purposes and is compared to other U.S. GHG emission inventories to provide context for the project GHG emissions.

In the BHDEP project emission inventory, emissions of the greenhouse gases $CO_2$, $CH_4$ and $N_2O$ from new and existing sources are quantified in terms of $CO_2$ equivalents ($CO_2e$). Measuring emissions in terms of $CO_2e$ allows for the comparison of emissions from different greenhouse gases based on their Global Warming Potential (GWP). GWP is defined as the cumulative radiative forcing of a gas over a specified time horizon relative to a reference gas resulting from the emission of a unit mass of gas. The reference gas is taken to be $CO_2$. The $CO_2e$ emissions for a greenhouse gas are derived by multiplying the emissions of the gas by the associated GWP. The GWPs for the inventoried greenhouse gases are $CO_2$:1, $CH_4$:21, $N_2O$:310 (EPA, 2011). Greenhouse gas emissions for construction and production are shown in Table 3.2-12.

**Table 3.2-12**
**Black Hills GHG Emissions (metric tons per year)**

| Pollutant | Construction | Production |
|---|---|---|
| $CO_2$ | 2,573.2 | 8,285.7 |
| $CH_4$ | 92.2 | 0.2 |
| $N_2O$ | 0.03 | 0.02 |
| $CO_2e$ | 4,521.1 | 8,294.2 |

## Modeling Results

Near-Field Modeling

Air pollutant dispersion modeling was performed to quantify maximum potential $PM_{10}$, $PM_{2.5}$, $NO_x$, CO, $SO_2$ and HAP impacts from construction and production. While air pollutant emissions from heavy equipment use and from wind erosion would occur at increased levels during well pad construction, potential impacts would be temporary, occurring only during the construction period. As a result, air quality impacts from well pad construction are not quantitatively assessed in this analysis. AERMOD was used to model the maximum potential emissions of $PM_{10}$, $PM_{2.5}$, $NO_x$, CO and $SO_2$ that could occur from the Proposed Action construction and production sources. Table 3.2-13 presents the maximum modeled air pollutant concentrations that could occur for any of these activities. When maximum modeled concentrations from both modeled scenarios are added to representative background concentrations, it is demonstrated that the total ambient air concentrations are less than the applicable NAAQS and CAAQS. In addition, direct modeled concentrations are below the applicable PSD Class II increments. While ozone impacts are not explicitly modeled, emissions of the ozone precursors $NO_X$ and VOC would be small and dispersed, and would present limited opportunity for formation of ground-level ozone from the Proposed Action.

Modeling was performed to estimate the maximum impacts that could occur from HAP emissions generated by construction and production sources. Potential maximum acute (short-term; 1-hour) HAP concentrations are shown in Table 3.2-14 compared with the acute RELs (EPA, 2011). RELs are defined as concentrations at or below which no adverse health effects are expected. No RELs are available for ethyl benzene and n-hexane; instead, the available IDLH/10 values are used. These IDLH values are determined by NIOSH and were obtained from EPA's Air Toxics Database (EPA, 2011). As shown in Table 3.2-14, the maximum predicted acute HAP concentrations are below the threshold levels.

**Table 3.2-13**
**Maximum Modeled Pollutant Concentration Impacts ($\mu g/m^3$)**

| Pollutant | Averaging Period | Direct Modeled | PSD Class II Increment[1] | Background | Total Predicted | NAAQS | CAAQS |
|---|---|---|---|---|---|---|---|
| CO | 1-hour | 374.8 | -- | 1,144.5 | 1,519.3 | 40,000 | 40,000 |
| | 8-hour | 69.2 | -- | 1,144.5 | 1,213.7 | 10,000 | 10,000 |
| $NO_2$ | 1-hour | 72.7 | -- | 92.1 | 164.8 | 188 | 188 |
| | Annual | 8.8 | 25 | 9.4 | 18.2 | 100 | 100 |
| $SO_2$ | 1-hour | 21.6 | -- | 31.4 | 53.0 | 196 | 196 |
| | 3-hour | 10.7 | 512 | 23.5 | 34.2 | 1,300 | 700 |
| | 24-hour | 1.8 | 91 | -- | -- | -- | -- |
| | Annual | 0.3 | 20 | -- | -- | -- | -- |
| $PM_{10}$ | 24-hour | 68.3 | 30 | 30.0 | 98.3 | 150 | 150 |
| | Annual | 8.1 | 17 | -- | -- | -- | -- |
| $PM_{2.5}$ | 24-hour | 7.1 | 9 | 12.0 | 19.1 | 35 | 35 |
| | Annual | 1.0 | 4 | 5.0 | 6.0 | 12 | 12 |

[1] The PSD demonstrations serve informational purposes only and do not constitute a regulatory PSD increment consumption analysis.

**Table 3.2-14**
**Maximum Modeled 1-Hour HAP Concentration Impacts (μg/m$^3$)**

| Air Toxics | Direct Modeled | REL |
|---|---|---|
| Benzene | 54.4 | 1,300 |
| Toluene | 123.3 | 37,000 |
| Ethyl benzene | 28.6 | 350,000[1] |
| Xylene | 165.9 | 22,000 |
| n-Hexane | 1,536.0 | 390,000[1] |
| Formaldehyde | 6.0 | 94 |

[1] No REL available for these air toxics. Values shown are from Immediately Dangerous to Life or Health (IDLH/10), EPA Air Toxics Database, Table 2 (EPA, 2011).

An analysis for long-term (annual) HAP concentrations was performed for formaldehyde emission resulting from the proposed compressor emissions. Annual HAP analyses were not performed for the other HAPs evaluated in this study (benzene, toluene, ethyl benzene and n-hexane) given that these emissions are likely to occur only during short-term duration, well completion activities and the emissions would not contribute significantly to long-term impacts.

The potential annual formaldehyde concentrations are shown in Table 3.2-15 compared to non-carcinogenic RfCs (EPA, 2012b). An RfC is defined by EPA as the daily inhalation concentration at which no long-term adverse health effects are expected. For the As shown in Table 3.2-15 the maximum modeled annual formaldehyde impacts are below the RfC levels.

**Table 3.2-15**
**Maximum Modeled Annual HAP Concentration Impacts (μg/m$^3$)**

| Air Toxic | Proposed Action | RfC |
|---|---|---|
| Formaldehyde | 0.02 | 9.8 |

Modeling was also performed to estimate the potential cancer risk resulting from compressor formaldehyde emissions. Formaldehyde impacts were evaluated based on estimates of the increased latent cancer risk over a 70-year lifetime. This analysis presents the potential incremental risk from formaldehyde and does not represent a total risk analysis. The cancer risks were calculated using the maximum predicted annual concentrations and EPA's chronic inhalation unit risk factors (URF) for carcinogenic constituents (EPA, 2012b). Two estimates of cancer risk are presented: 1) a most likely exposure (MLE) scenario; and 2) a maximum exposed individual (MEI) scenario. The estimated cancer risks are adjusted to account for duration of exposure and time spent at home.

The adjustment for the MLE scenario is assumed to be nine years, which corresponds to the mean duration that a family remains at a residence (EPA, 1993). This duration corresponds to an adjustment factor of 9/70 = 0.13. The duration of exposure for the MEI scenario is assumed to be 20 years (i.e., the life of the project), corresponding to an adjustment factor of 20/70 = 0.286. A second adjustment is made for time spent at home versus time spent elsewhere. For the MLE scenario, the at-home time fraction is 0.64 (EPA, 1993) and it is assumed that during the rest of the day the individual would remain in an area where annual air toxics concentrations would be one-quarter as large as the maximum annual average concentration. Therefore, the final MLE adjustment factor is (0.13) x [(0.64 x 1.0) + (0.36 x 0.25)] = 0.094. The MEI scenario assumes that the individual is at home 100 percent of the time, for a final MEI adjustment factor of (0.286 x 1.0) = 0.268.

The modeled long-term risk from formaldehyde emissions are shown in Table 3.2-16. Under both the MLE and MEI scenarios, the estimated cancer risk associated with long-term exposure to formaldehyde is less than a one-in-one-million cancer risk.

**Table 3.2-16**
**Long-term Modeled MLE and MEI Cancer Risk Analyses**

| Analysis | Air Toxic | Modeled Concentration ($\mu g/m^3$) | Unit Risk Factor $1/(\mu g/m^3)$ | Exposure Adjustment Factor | Cancer Risk |
|---|---|---|---|---|---|
| MLE | Formaldehyde | 0.06 | $1.3 \times 10^{-5}$ | 0.094 | $7.2 \times 10^{-8}$ |
| MEI | Formaldehyde | 0.06 | $1.3 \times 10^{-5}$ | 0.286 | $2.2 \times 10^{-7}$ |

Far-Field Modeling

Far-field modeling at Class I and sensitive Class II areas within 100 km of the project area using the CALPUFF model was performed to quantify potential air quality impacts to both ambient air concentrations and AQRVs from air pollutant emissions of $NO_x$, $SO_2$, $PM_{10}$ and $PM_{2.5}$ expected to result from the Proposed Action. The Class I and sensitive Class II areas analyzed include the Class I Black Canyon of the Gunnison Wilderness, Flat Tops Wilderness, Maroon Bells–Snowmass Wilderness, West Elk Wilderness Arches National Park and the Class II Raggeds Wilderness Area and Colorado National Monument.

*PSD Increment Comparison*. The direct modeled concentrations of $NO_2$, $SO_2$, $PM_{10}$ and $PM_{2.5}$ at Class I and sensitive Class II areas are provided in Table 3.2-8 for comparison to applicable PSD Class I and Class II increments. As shown in Table 3.2-17, these values are well below the PSD Class I and Class II increments.

**Table 3.2-17**
**Maximum Modeled Pollutant Concentrations at PSD Class I and Sensitive Class II Areas ($\mu g/m^3$)**

| Location | Pollutant | Averaging Time | Direct Modeled | PSD Increment |
|---|---|---|---|---|
| Arches National Park | $NO_2$ | Annual | 0.0011 | 2.5 |
| | $SO_2$ | 3-hour<br>24-hour<br>Annual | 0.001<br>0.0004<br>0.00005 | 25<br>5<br>2 |
| | $PM_{10}$ | 24-hour<br>Annual | 0.056<br>0.003 | 8<br>4 |
| | $PM_{2.5}$ | 24-hour<br>Annual | 0.027<br>0.001 | 2<br>1 |
| Black Canyon of the Gunnison Wilderness Area | $NO_2$ | Annual | 0.0010 | 2.5 |
| | $SO_2$ | 3-hour<br>24-hour<br>Annual | 0.0012<br>0.0005<br>0.00003 | 25<br>5<br>2 |
| | $PM_{10}$ | 24-hour<br>Annual | 0.056<br>0.0038 | 8<br>4 |
| | $PM_{2.5}$ | 24-hour<br>Annual | 0.029<br>0.0015 | 2<br>1 |
| Flat Tops Wilderness Area | $NO_2$ | Annual | 0.0005 | 2.5 |
| | $SO_2$ | 3-hour<br>24-hour<br>Annual | 0.0005<br>0.0002<br>0.00002 | 25<br>5<br>2 |
| | $PM_{10}$ | 24-hour<br>Annual | 0.053<br>0.004 | 8<br>4 |
| | $PM_{2.5}$ | 24-hour<br>Annual | 0.022<br>0.001 | 2<br>1 |
| Maroon Bells-Snowmass Wilderness Area | $NO_2$ | Annual | 0.0004 | 2.5 |
| | $SO_2$ | 3-hour<br>24-hour<br>Annual | 0.0003<br>0.0001<br>0.00002 | 25<br>5<br>2 |
| | $PM_{10}$ | 24-hour<br>Annual | 0.046<br>0.0034 | 8<br>4 |
| | $PM_{2.5}$ | 24-hour<br>Annual | 0.019<br>0.0013 | 2<br>1 |
| West Elk Wilderness Area | $NO_2$ | Annual | 0.0003 | 2.5 |
| | $SO_2$ | 3-hour | 0.0006 | 25 |

| Location | Pollutant | Averaging Time | Direct Modeled | PSD Increment |
|---|---|---|---|---|
| | | 24-hour<br>Annual | 0.0002<br>0.00002 | 5<br>2 |
| | $PM_{10}$ | 24-hour<br>Annual | 0.029<br>0.0024 | 8<br>4 |
| | $PM_{2.5}$ | 24-hour<br>Annual | 0.013<br>0.001 | 2<br>1 |
| Raggeds Wilderness Area | $NO_2$ | Annual | 0.0003 | 25 |
| | $SO_2$ | 3-hour<br>24-hour<br>Annual | 0.0005<br>0.0001<br>0.00002 | 512<br>91<br>20 |
| | $PM_{10}$ | 24-hour<br>Annual | 0.039<br>0.0028 | 30<br>17 |
| | $PM_{2.5}$ | 24-hour<br>Annual | 0.016<br>0.001 | 9<br>4 |
| Colorado National Monument | $NO_2$ | Annual | 0.0087 | 25 |
| | $SO_2$ | 3-hour<br>24-hour<br>Annual | 0.0072<br>0.0021<br>0.0003 | 512<br>91<br>20 |
| | $PM_{10}$ | 24-hour<br>Annual | 0.158<br>0.023 | 30<br>17 |
| | $PM_{2.5}$ | 24-hour<br>Annual | 0.0591<br>0.0060 | 9<br>4 |

*AQRV Impacts*.

Visibility Impacts. Visibility impacts estimated, calculated following FLAG 2010 (FLAG, 2010), at Class I and sensitive Class II areas resulting from Proposed Action source emissions are shown in Table 3.2-18. The visibility analysis indicated that there are zero days predicted above the 0.5 delta-deciviews (Δdv) threshold at any of the Class I and sensitive Class II areas. A maximum predicted visibility impact was 0.21 Δdv, occurring at Colorado National Monument.

**Table 3.2-18**
**Maximum Visibility Impacts at Class I and Sensitive Class II Areas**

| Location | Maximum Impact (Δdv) |
|---|---|
| Arches National Park | 0.12 |
| Black Canyon of the Gunnison Wilderness Area | 0.11 |
| Flat Tops Wilderness Area | 0.09 |
| Maroon Bells/Snowmass Wilderness Area | 0.07 |
| West Elk Wilderness Area | 0.05 |
| Raggeds Wilderness Area | 0.06 |
| Colorado National Monument | 0.21 |

Deposition Impacts. Potential direct atmospheric deposition impacts within Class I and sensitive Class II areas were also calculated for the Proposed Action. At all Class I and sensitive Class II areas, the maximum direct total (wet and dry) N and S deposition were predicted to be well below the BLM thresholds of 3 kg/ha-yr for S and 1.5 kg/ha-yr for N. The predicted deposition values at each sensitive area are also well below the DAT of 0.005 kg/ha-yr. The maximum predicted deposition impacts occurred at Colorado National Monument and are 0.0018 kg/ha-yr (nitrogen) and 0.0001 kg/ha-yr (sulfur).

In addition, potential changes in ANC, resulting from potential N and S deposition from the expanded facility, were calculated for nine sensitive lakes within the Flat Tops, Maroon Bells–Snowmass, Raggeds and West Elk Wilderness areas. For all lakes the estimated changes in ANC were all predicted to be less than the significance thresholds (Forest Service, 2000). The

estimated change in ANC was 0.003 percent at Avalanche Lake, 0.003 percent at Capitol Lake, 0.011 percent at Moon Lake, 0.016 percent at Deep Creek Lake, 0.016 percent at Lower Packtrail Pothole, 0.010 percent at Upper Packtrail Pothole, 0.012 percent at Ned Wilson Lake and 0.003 percent at South Golden Lake (compared to the 10 percent threshold) and a 0.005 µeq/l change at the more sensitive Upper Ned Wilson Lake (compared to a 1.0 µeq/l threshold for sensitive lakes).

**Greenhouse Gas Emissions**

The maximum GHG emissions resulting from the Proposed Action source emissions are estimated at 8,294.2 metric tons per year [0.008 terragrams (tg)/yr] of $CO_2$ equivalent emissions. To place the project GHG emissions in context, the GHG emissions from the top five emitting coal-fired power plants in Colorado range from 3.5 to 9.8 tg/year (EPA, 2012c).

**Protective/Mitigation Measures**

The following measures are included in Black Hills' proposal to minimize impacts to air quality:

- All drilling rig engines would be Tier 2 compliant, reducing emissions.
- Drilling and completion workers would carpool to well locations, to reduce traffic and fugitive dust emissions.
- Fugitive dust would be controlled on the access roads and disturbed surfaces during construction. Speed limits would be enforced from the beginning of construction throughout the life of the project, and where speed limits are not posted on unpaved access roads, speeds would not exceed 20 miles per hour.

The following BLM GJFO Standard COA would help minimize impacts to air quality:

- The operator will prevent and abate fugitive dust as needed, whether created by vehicular traffic, equipment operations or wind events. If dust abatement is insufficient, the BLM may direct the operator to change the level and type of treatment. BLM approval is required before application of surfactants, binding agents, or other dust-suppression chemicals on federally permitted projects and on public lands. More stringent dust control may be required in areas adjacent to Federal- or State-listed threatened, endangered, or sensitive plant species.

No additional protective/mitigation measures would be required by the BLM to further reduce impacts to air quality.

**<u>No Action Alternative</u>**

Under the No Action Alternative, emissions described above under the Proposed Action would not occur and there would be no resulting impact to air quality and AQRVs.

### 3.2.2 Mineral Resources

#### 3.2.2.1 Current Conditions

Most of the natural gas in the area is produced from fluvial sandstone beds in the Wasatch Formation and from the Upper Cretaceous Mesaverde and Hunter Canyon formations. Alternatively, most coal-bed methane production is from rocks in the Cameo Coal zone of the mid- to lower part of the Mesaverde Formation (Hail and Smith, 1997). In addition to methane

produced from Cameo coal zone, other potential gas producing formations in this area include the Rollins, Cozzette, Corcoran, Dakota and Cedar Mountain sandstones.

#### 3.2.2.2 Environmental Consequences

**Proposed Action Alternative**

The proposed wells would target gas reservoirs within the Mesaverde, Rollins, Cozzette, Corcoran, Frontier, Sego, Mancos, Dakota and Cedar Mountain sandstones at depths ranging from 1,500 to 9,000 feet below the surface and would result in natural gas and water being produced. The Proposed Action would contribute to draining the hydrocarbon-bearing reservoirs in the area. It is not possible to predict the amount of natural gas that would be produced from the proposed wells; however, Black Hills estimates that up to 144 bcf of natural gas (6 bcf per well) would be produced over the life of the project (estimated to be 20 years). Initial production rates would be highest during the first few years of production and then steadily decline over the life of the well.

**Protective/Mitigation Measures**

The following measures are included in Black Hills' proposal:

- Drilling operations would be conducted in compliance with all Federal Onshore Oil and Gas Orders and other applicable rules and regulations.
- The proposed casing and cementing program would be designed to protect and/or isolate all usable water zones, potentially productive zones, lost circulation zones, abnormally pressured zones and prospectively valuable deposits of Cameo coal.

At the time of APD approval, the BLM would identify and require as Downhole Conditions of Approval additional measures to further protect mineral resources under the Proposed Action.

**No Action Alternative**

Under the No Action Alternative, the proposed wells would not be drilled and natural gas and water resulting from the Proposed Action would not be produced. Existing oil and gas production in the area would continue.

### 3.2.3 Soils (Includes a Finding on Standard 1)

#### 3.2.3.1 Current Conditions

Soils within the project area were identified and characterized using the NRCS soil survey of Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa counties, Colorado (NRCS, 2003). Information in this survey was supplemented with the NRCS Soil Survey Geographic (SSURGO) Database Descriptions which include both spatial and tabular data (NRCS, 2012a).

The five principal factors of soil formation include parent material, climate, relief, living organisms or biological activity and time. In the project area, soil differences are primarily a result of the relative importance or dominant influence of the various soil formation factors. The main climatic characteristics affecting soil formation are precipitation and temperature. The driest parts of the project area are at lower elevations near De Beque where the elevation is about 4,900 feet. In this area, the annual precipitation ranges from about 7 and 10 inches and the mean annual temperature is about 50$^{o}$F. Elevations in the project area range between 4,950 and 6,450 feet. Soils formed under these warm and dry conditions are typically low in organic matter, light in color and contain calcium carbonate at or near the surface. Some soils are saline or sodic such as the Uffens, Bunkwater and Youngston soils.

Topographic conditions such as slope gradient, configuration and aspect also affect soil development. These features influence the amount of water that reaches the soil, the amount of water that is retained by the soil and the amount of water that runs off the soil. Topographic conditions also influence soil development by the amount of colluvial deposition that occurs onto some soils. Geologic or accelerated erosion, soil temperature and wind movement are also affected by topographic relief. Steep terrain within the project area is located where soils were formed from colluviums derived from the higher and commonly steeper areas. For example, Happle soils on alluvial fans consist largely of channery colluviums derived soils from outcrops of highly fractured rock. In steep or extremely steep areas, rapid runoff rates limits soil formation through erosion and water infiltration which is limited contribution to soil profile development. Steep soils in the project area commonly are shallow. Soils developed in low-lying areas are influenced by runoff from surrounding steeper areas and materials (alluvium) deposited by streams or rivers in alluvial valleys and are typically deep (NRCS, 2003).

The soils in the project area formed in several types of parent materials including marine shales of the Wasatch Formation (i.e., Biedsaw, Sunup, Dominguez Wrayha, Veatch and Rabbitex soils) and siltstones and hard shales of the Green River Formation (i.e., Happle soils). Additionally, floodplain or stream-deposited sediments of mixed origin including the Uffens, Panitchen and Youngston soils; as well as soils derived from wind-laid (eolian) deposits, Barx and Bunkwater are located on structural benches and plateaus.

The soils that occur within the project area and that would be affected by the Proposed Action are described below, grouped by landform position. Table 3.2-19 provides a listing of these soils with their dominant limiting characteristics.

**Alluvial Soils on Floodplains, Stream Terraces and Narrow Valleys.** These soils are deep to very deep, well-drained soils and have an effective rooting depth of 60 inches or more. They formed in alluvium derived from mixed materials. Permeability is moderate slow to high and the available water capacity is moderate to high. The Panitchen and Youngston loams soils are considered prime farmland, if irrigated. The Panitchen soil is located along alluvial valleys throughout the project area including South Fork Dry Fork, Dry Fork, Roan Creek. In the Winter Flats area, this soil is found within Alikali Canyon, Redrock Canyons and Sulphur Gulch, as well as along the Colorado River. The Youngston loam soils are located in the lower reaches of Roan Creek and along the Colorado River near De Beque. Irrigated croplands (hayfields) on this soil mapping unit would be affected by project components. Similar to the Panitchen soil, the Uffens loam soil is located in the project area along South Fork Dry Fork, Dry Fork, Roan Creek and along the Colorado River; however this soil is not considered a prime farmland soil and is strongly alkaline and highly saline and sodic at depths of 5 to 27 inches.

**Alluvial Soils on Fans and Toe Slopes.** These soils are deep, well-drained and have an effective rooting depth of 60 inches or more. Available water capacity is low to moderate and is slightly to moderately alkaline throughout the profile. The Dominguez clay is classified as a prime farmland soil if irrigated; however, none of the project area soils in this mapping unit are farmed or irrigated. This soil has a high content of clay. The Happle soil has a moderate permeability and a severe water erosion hazard and contains over 35 percent coarse fragments in the profile.

**Table 3.2-19**
**Soil Types and Limiting Soil Characteristics**

| Map Unit Number | Mapping Unit Name[1] | Water Erosion[2] | Wind Erosion[3] | Steep Slopes[4] | Large Stones[5] | Restrictive Layer[6] | Reclamation Sensitivity[7] | Saline/Sodic[8] | Compaction[9] | Hydric Soils[10] | Prime Farmland[11] | Flooding Hazard Frequency[13] | Water Table[14] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Soils on Floodplains, Stream Terraces and Narrow Valleys** | | | | | | | | | | | | | |
| 54 | Panitchen loam, 1 to 6 percent slopes | Moderate | Moderate | No | No | No | No | No | Yes | No | Yes[12] | None | No |
| 70 | Uffens loam, 1 to 8 percent slopes | Very Severe | Moderate | No | No | No | Yes | Yes | Yes | No | No | None | No |
| 78 | Youngston loam, 1 to 6 percent slopes | Slight | Low | No | No | No | No | Yes | No | No | Yes[12] | None | No |
| **Alluvial Soils on Fans and Toe Slopes** | | | | | | | | | | | | | |
| 32 | Dominguez clay loam, 3 to 8 percent slopes | Severe | Moderate | No | No | No | No | No | Yes | No | Yes[12] | None | No |
| 44 | Happle very channery sandy loam, 3 to 12 percent slopes | Severe | Low | No | Yes | No | Yes | No | No | No | No | None | No |
| **Soils on Structural Benches, Plateaus and Mesas** | | | | | | | | | | | | | |
| 3 | Barx loam, 3 to 12 percent slopes | Severe | Moderate | No | No | No | No | No | Yes | No | No | None | No |
| 4 | Barx-Clapper complex, 3 to 12 percent slopes | Severe | Moderate | No | No | No | No | No | Yes | No | No | None | No |
| 12 | Bunkwater very fine sandy loam, 1 to 8 percent slopes | Severe | Moderate | No | No | No | Yes | Yes | Yes | No | No | None | No |
| 69 | Travessilla-Rock outcrop complex, 10 to 35 percent slopes | Very Severe | Moderate | Yes | No | Yes | Yes | No | No | No | No | None | No |
| **Soils on Slopes of Mountains, Hills, Ridges and Canyonlands** | | | | | | | | | | | | | |
| 2 | Badland, 10 to 65 percent slopes | Severe | Low | Yes | No | Yes | Yes | No | No | No | No | None | No |
| 7 | Biedsaw-Sunup gravelly loams, 10 to 40 percent slopes | Severe | Moderate | Yes | No | No | No | No | Yes | No | No | None | No |
| 61 | Rock outcrop-Torriorthents complex, 15 to 90 percent slopes | Very Severe | Moderate | Yes | No | Yes | Yes | Yes | No | No | No | None | No |
| 66 | Torriorthents, warm-Rock outcrop complex, 35 to 90 percent slopes | Very Severe | Moderate | Yes | No | Yes | Yes | Yes | Yes | No | No | None | No |
| 76 | Wrayha-Veatch-Rabbitex complex, 12 to 45 percent slopes | Very Severe | Moderate | Yes | No | No | Yes | No | No | No | No | None | No |

[1] Soil group ratings are based on the dominant soil type for the soil map unit. Inclusions of sensitive soil types may be found within soil map units that do not receive sensitive ratings.
[2] Water Erosion – soils sensitive to water erosion have an NRCS rating of high or severe.
[3] Wind Erosion – soils sensitive to wind erosion are in the NRCS wind erodibility groups 1 and 2. Soil textures include very fine sand, fine sand, sand, coarse sand, loamy very fine sand, loamy fine sand, loamy sand and loamy coarse sand; very fine sandy loam and silt loam with 5 percent or less clay and 25 or less percent very fine sand; and sapric soil materials (as defined in Soil Taxonomy); except Folists.
[4] Steep Slopes – sensitive soils occur in soil map units when slopes are greater than 30 percent.
[5] Large Stones – soils with greater than 25 percent cobbles and/or stones in the soil profile can present problems with surface reclamation. Soil with large quantities of large stones hold less available water for plant growth and generally require broadcast seeding methods.
[6] Restrictive Soils – soils that have a lithic, paralithic, or other restrictive soil layer within 60 inches of the soil surface. These soils have shallow profiles and hold less available water for plant growth.

[7] Reclamation Sensitivity – soils having reclamation sensitivity is a combined rating for soils with high or severe erosion potential, steep slopes, large stones, shallow soils and saline or sodic conditions and clayey soils (greater than 40 percent). This also includes soil map units with dominant amounts of rock outcrop. BMPs are generally required to reduce erosion and sedimentation potential in these soils. Restoration of these soils in most cases requires adaptive seed mixtures and implementation of revegetation practices (i.e., scarification, fertilization, proper seeding techniques, mulching, monitoring, etc.) to enhanced revegetation success. Revegetation of areas with extensive rock outcrop may not be possible.

[8] Saline/Sodic Soils – includes soils with an electrical conductivity of 8 mmhos/cm or greater and/or a Sodium Adsorption Ratio (SAR) of 13 or greater. Saline/sodic soils may require special handling of materials and/or special seed mixes.

[9] Soil Compaction – sensitive soils include those with an NRCS rating of high or severe. Ratings are based on depth to a water table, rock fragments on or below the surface, the Unified classification, depth to a restrictive layer and slope.

[10] Hydric Soils – at least one major named map unit soil is included on the county hydric soil list.

[11] Prime Farmland – dominant map unit soil is included on either the state or county list of farmland of importance.

[12] Prime farmland, if irrigated.

[13] High Water Table – NRCS ratings of soils which have a saturated zone in the soil profile within 60 inches of the surface in most years. A saturated zone that lasts for less than a month is not considered a water table.

[14] Flooding Hazard - temporary inundation of an area caused by overflowing streams or runoff from adjacent slopes.

**Soils on Structural Benches, Plateaus and Mesas.** The Barx, Clapper and Bunkwater soils are deep, well-drained and found on structural benches. They have an effective rooting depth of 60 inches or more. The Bunkwater soil is moderately to strongly alkaline and saline and sodic at depths of greater than 2 inches. The Travessilla-Rock outcrop complex is found on steeper slopes on dissected mesas. The Travessilla soil is shallow to very shallow, well-drained and has an effective rooting depth of 4 to 20 inches. All of these soils have a severe water erosion hazard.

**Soils on Slopes of Mountains, Hills Ridges and Canyonlands.** The soils in this group are characterized by steep eroding slopes and rock outcrops in the project area. Where limited topographic conditions allow, alluvial soils have developed including the Biedsaw-Sunup, Torriorthents and Wrayha-Veatch-Rabbitex soils. The Biedsaw-Sunup and Wrayha-Veatch-Rabbitex soils are deep, well-drained soils that contain up to 5 percent coarse fragments, have an effective rooting depth of 60 inches and are slightly alkaline, non-saline or sodic. The Torriothents soils have up to 25 percent coarse fragments and have a restrictive layer of hard or soft bedrock and are slightly saline. The hazard of water erosion for all the soils in this group is severe to very severe. The rock outcrops consist of barren escarpments, ridge caps and rock points of sandstone.

**Public Land Health Standard 1 (Upland Soils)**

Standard 1 - Upland soils exhibit infiltration and permeability rates that are appropriate to soil type, climate, land form and geologic processes.

BLM completed a Land Health Assessment for the DeBeque/Roan Creek landscape area, evaluated in 2004 and 2006 (BLM, 2009a). The BLM (2009a, Table 3-1) determined that most of the assessed area, including the project area, met Standard 1. Problems, where documented, were related to lack of vegetative cover on the soil surface and resulting erosion.

In 2010, a Land Health Assessment was completed for the Big Park grazing allotment which includes the Horseshoe Canyon area. Soils were stable within the project area and vicinity, including a range site that had experienced a wildfire. Twelve percent of the range sites within the project area were not meeting Public Land Health Standard 1 or had problems meeting the standard, generally because of the presence of noxious weeds, especially cheatgrass.

### 3.2.3.2 Environmental Consequences

**<u>Proposed Action Alternative</u>**

The soil series data (i.e., soil mapping units) from the county soil survey reports and SSURGO Geographic Databases were utilized to conduct a detailed analysis of the potential construction and operation impacts to soils resulting from the Proposed Action. Typically, these sources map soils (mapping units) at a scale of 1:24,000, which provides the best or most detailed soil information available. A database was developed incorporating the soil series characteristics listed in Table 3.2-19. Spatial analysis using GIS was completed to determine the number of acres within each soil series (mapping unit) that would be affected by the proposed well pads, roads, gathering pipelines and centralized facilities, so that potential impacts could be accurately quantified within each soil association.

Table 3.2-20 provides a listing of soils by landform group and indicates acres and percent of disturbance under the Proposed Action within each group.

Surface disturbance has the potential to adversely affect natural soil characteristics and, consequently, soil productivity and restoration potential, during clearing and grading, trenching and clean-up. Potential soil impacts include:

- soil erosion due to water, wind, loss of vegetation and mass wasting,
- soil compaction and damage to soil structure resulting from the movement of heavy construction equipment,
- soil mixing or displacement from grading/excavation and reclamation,
- rutting from equipment or vehicle traffic,
- structural damage to wet or frozen soils and soils with poor drainage and
- introduction of large stones or blast rock into the topsoil as a result of construction.

Table 3.2-21 provides a summary of the acres of disturbance to each of the sensitive soil characteristic groups that would be affected by the Proposed Action. Based on the soil mapping unit characteristics, many of the soils affected occur within multiple sensitive soil groups. A number of the soil mapping units that would be affected by the Proposed Action are soil complexes, which are composed of more than one soil series because the soils are so intermingled that they cannot be mapped separately at the scale of the survey maps. For this analysis, the dominant soil series in the mapping unit was used to assess the sensitive soil characteristics or groups affected by the Proposed Action. Because NRCS soil survey data for the various soil parameters are typically reported as ranges (i.e., slopes: 12 to 45 percent), the soil mapping unit was considered to be within a sensitive soil group if the specific soil parameter range exceeded the sensitive soil threshold, such as 30 percent for steep slopes. Therefore, this analysis makes the 'worst-case' assumption that all areas of disturbance would occur within the areas of the soil mapping unit that exceed the sensitive soil threshold criteria.

**Table 3.2-20**
**Proposed Surface Disturbances by Soil Mapping Unit**

| Soil Mapping Unit Number | Soil Mapping Unit Number | Acres (percent) |
|---|---|---|
| **Alluvial Soils on Floodplains, Stream Terraces and Narrow Valleys** | | |
| 54 | Panitchen loam, 1 to 6 percent slopes | 22.74 (7.58) |
| 70 | Uffens loam, 1 to 8 percent slopes | 35.01 (11.67) |
| 78 | Youngston loam, 1 to 6 percent slopes | 7.92 (2.64) |
| | **Total** | **65.67 (21.89)** |
| **Alluvial Soils on Fans and Toe slopes** | | |
| 32 | Dominguez clay loam, 3 to 8 percent slopes | 8.04 (2.68) |
| 44 | Happle very channery sandy loam, 3 to 12 percent slopes | 31.17 (10.39) |
| | **Total** | **39.21 (13.07)** |
| **Soils on Structural Benches, Plateaus and Mesas** | | |
| 3 | Barx loam, 3 to 12 percent slopes | 20.64 (6.88) |
| 4 | Barx-Clapper complex, 3 to 12 percent slopes | 23.96 (7.99) |
| 12 | Bunkwater very fine sandy loam, 1 to 8 percent slopes | 33.92 (11.31) |
| 69 | Travessilla-Rock outcrop complex, 10 to 35 percent slopes | 37.22 (12.41) |
| | **Total** | **115.74 (38.59)** |
| **Soils on Slopes of Mountains, Hills, Ridges and Canyonlands** | | |

| Soil Mapping Unit Number | Soil Mapping Unit Number | Acres (percent) |
|---|---|---|
| 2 | Badland, 10 to 65 percent slopes | 11.77 (3.92) |
| 7 | Biedsaw-Sunup gravelly loams, 10 to 40 percent slopes | 34.27 (11.43) |
| 61 | Rock outcrop-Torriorthents complex, 15 to 90 percent slopes | 0.42 (0.14) |
| 65.67+39.21+115.74+79.32<br>66 | Torriorthents, warm-Rock outcrop complex, 35 to 90 percent slopes | 8.64 (2.88) |
| 76 | Wrayha-Veatch-Rabbitex complex, 12 to 45 percent slopes | 24.22 (8.08) |
| | **Total** | **79.32 (26.45)** |
| | **Total** | **299.94[1]** |
| [1] Actual short-term disturbance under the Proposed Action is estimated to be 268 acres with well pads not to exceed 6.8 acres each. | | |

**Table 3.2-21**
**Proposed Surface Disturbance in Sensitive Soils**

| Sensitive Soil Characteristic | Total (acres) |
|---|---|
| Water Erosion Hazard[2] | 269.28 |
| Wind Erosion Hazard[3] | 0.00 |
| Steep Slopes[4] | 116.53 |
| Large Stones[5] | 0.00 |
| Restrictive Layer[6] | 58.05 |
| Reclamation Sensitivity[7] | 182.38 |
| Saline/Sodic[8] | 108.66 |
| Compaction Potential[9] | 187.22 |
| Hydric Soils[10] | 0.00 |
| Prime Farmlands[11 & 12] | 38.70 |
| Flooding Hazard[13] | 0.00 |
| High Water Table[14] | 0.00 |
| See Table 3.2-19 for footnotes defining sensitive soil characteristics. | |

Soil disturbance could be difficult to reclaim due to sensitive soil characteristics (e.g., low available water content, steep slopes, shallow profiles and coarse textures or content of rock fragments). Construction would affect soils that are easily eroded and compacted, that are on steep slopes, that are shallow to a restrictive layer and that are potentially saline. The invasion of noxious weeds into disturbed areas could occur on all soil types, but the potential for weed invasion is typically greater on soils that are difficult to reclaim due to their sensitive or droughty characteristics. Based on the NRCS soil survey data (NRCS, 2003 and 2012a), the wind erosion hazard of undisturbed soil indicates that these soils are generally not susceptible to blowing. However, soil disturbance such as grading/blading would likely increase the wind erosion hazard of soil in the short-term until soils have crusted, settled, or been compacted. Based on NRCS soil surveys, no hydric soils would be affected as a result of the Proposed Action.

The Badland map unit, found within the project area at proposed well pad HSC 1-22 and along the associated road to this well pad, is very shallow and exhibits no dominant soil characteristics. Permeability is very slow and the hazard of water erosion is very severe.

**Water Erosion.** The Proposed Action (analysis of 10-acre well pads) would affect a total of about 269 acres of soils (90 percent of total soils affected) that have a high or severe erosion potential, as indicated in the NRCS soil surveys. Implementation of the site-specific SWMPs that include adaptive BMPs could minimize erosion and the potential increase in sediment transport. Storm water regulations also require monitoring and reporting protocols to make sure that soil conditions and BMPs are adapted and maintained in functioning condition. BMPs might include run-on/run-off controls, such as swales, ditches or berms, sediment catchments, anchored barriers such as erosion blankets or straw wattles, revegetation and other controls based on site-specific conditions. Implementing appropriate restoration and revegetation practices (see Reclamation Sensitivity) would help stabilize disturbed areas in the short- and long-term.

**Steep Slopes.** Based on the slope ranges of NRCS soil mapping units (NRCS, 2003 and 2012a), construction would affect a total of about 117 acres of soil mapping units (39 percent of the total soils affected) that have slope ranges which exceed 35 percent. Soils on steep slopes (those exceeding 40 percent) are particularly susceptible to accelerated erosion and slumping when deep road cuts or other surface-disturbing activities take place. Many of the soils on less steeply sloping areas are also highly susceptible to erosion and management should implement designs that reduce erosion and sediment yield (BLM, 1985). Soils derived from weathered shales of the Wasatch Formation occurring on northeast facing slopes that exceed 35 percent are prone to slumping and mass wasting when disturbed.

Project components have been located (based on civil surveys and on-site inspections) to avoid or minimize disturbance to steep slopes, to the extent practical. Additional GIS analysis with digital elevation data was used to determine where proposed well pad locations could affect soils on slopes of 40 percent or more. Based on these modeling efforts, the only well pad that would potentially affect slopes that are 40 percent or greater is Well Pad HDU 17-43 which is located on soil Mapping Unit 76 Wrayha-Veatch-Rabbitex complex, 12 to 45 percent slopes. Construction of this pad would potentially require a cut into slopes greater than 40 percent on the southwest corner of the pad. This well pad was co-located with an existing well pad and was designed based on site-specific conditions to balance cut and fill requirements to minimize disturbance and grading requirements. In the Horseshoe Canyon area, the existing access road to proposed well pad HSC 1-20, which is proposed for improvement, traverses side slopes that exceed 35 percent on Soil Mapping Unit 66 (Torriorthents, Warm-Rock outcrop complex, 35 to 90 percent slopes). Additionally, the water supply line from HSC CF#3 crosses slopes in excess of 40 percent on Soil Mapping Unit 61 (Rock outcrop-Torriorthents complex, 15 to 90 percent slopes).

Surface disturbance on BLM-administered lands is proposed to be consistent with guidelines outlined in *Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development*, (BLM and Forest Service, 2007), generally known as *The Gold Book* – BMPs proposed to minimize potential impacts on steep slopes might include run-on/run-off controls, laid-back cut and fill slopes, soil texturing to capture or slow water to prevent erosions, sediment catchments, angular rock armor and armored outfalls. Reclamation BMPs on steep slopes would typically include immediate temporary seeding of cut and fill slopes and topsoil storage areas, seedbed preparation such as soil pocking and application of crimped or hydro- applied mulch, or anchored erosion control fabric. Such measures could also be implemented on slopes of less than 30 percent.

**Large Stones.** Profiled soils likely to be composed of more than 25 percent rock fragments are included as sensitive soils. Soils with large volumes of cobbles or stones can present problems with reclamation because they hold less available water for plant growth, and might require broadcast rather than drill seeding methods when large rocks on the surface prevent drill seeding methods. As indicated in Table 3.2-21, none of the soils in the project area that would be affected by the Proposed Action contain 25 percent or more large stones.

**Restrictive Layer.** Soils that are rated as having a restrictive layer are shallow soils that have a lithic, paralithic, or other restrictive soil layer within 60 inches below the soil surface. These soils have thin profiles, restrictive root zones and hold less available water for plant growth. Shallow soils and hard bedrock can also restrict construction or trenching operations and might require special equipment (rock hammers/saws) or blasting to efficiently excavate well pads or trenches to required design depths. Soils in this group are also included as soils that have reclamation sensitivity. As indicated in Table 3.2-21, construction would affect a total of about 58 acres of soils that have a restrictive layer (19 percent of the total soils affected).

**Saline/sodic soils.** Sensitive soils in this group include soils that have an electrical conductivity of 8 micro mhos per centimeter (mmhos/cm) or greater and/or a Sodium Adsorption Ratio (SAR) of 13 or greater. Saline and sodic soils can be difficult to revegetate and generally require specially adapted seed mixes (see Table 2.2-8). Per Table 3.2-21, construction would affect about 109 acres of saline and sodic soils in this group (36 percent of the total soils affected).

**Compaction.** Soil compaction results when internal pore space is reduced due to physical pressure exerted on the surface. Compaction can result in soil conditions that reduce infiltration, permeability and gaseous and nutrient exchange rates within the soil. These processes are critical to viability of vegetative species. Physical resistance to root growth can occur when soils are compacted. Unmitigated soil compaction can result in long-term impacts to soil productivity and increased erosion due to increased runoff. Soils in the group sensitive to compaction were determined based on the NRCS rating of High or Severe for the category 'Haul Roads, Log Landings and Soil Rutting.' Soil ratings in this group are based on unified soil texture classification, rock fragments on or below the surface depth to a restrictive layer, depth to a water table and on slopes. As indicated in Table 3.2-21, soils susceptible to compaction comprise the largest sensitive soil group that would be disturbed, a total of about 187 acres of disturbance or 62 percent of the total soils affected.

**Reclamation Sensitivity.** As shown in Table 3.2-21, construction would affect a total of about 182 acres of soils rated as having reclamation sensitivity (61 percent of the total soils affected within the project area). Soils in this group may have high or severe erosion potential, steep slopes, shallow soils, are saline and/or sodic, or have coarse soil textures or large rock fragments that minimize the soil's available water content. Reclamation and stabilization of these soils typically require site-specific recontouring, special seedbed preparation, appropriate seeding techniques and seed mixtures, as well as mulch, monitoring and weed control. Site-specific conditions might recommend techniques such as pitting or pocking the soil or the use of mulch to conserve moisture. Topsoil availability might be limited, so shredding of woody vegetation to be salvaged with topsoil and then redistributed during reclamation might enhance organic matter content and water-holding capabilities of sensitivity soils. Soils that are difficult to revegetate also tend to be more susceptible to noxious weed infestations.

This soil group also includes soil map units dominated by rock outcrops where revegetation might not be possible. Specific climatic conditions in the project area, such as rainfall and temperature, also affect soil reclamation potential. Implementation of the revegetation measures outlined in the BLM GJFO Standard COAs that require topsoil salvaging and appropriate

reclamation BMPs such as scarification, seedbed preparation, appropriate seed mixtures and seeding methods would minimize the potential impact to soils productivity.

**High Water Table and Flooding Hazard.** Soils with a high water table are rated based on NRCS criteria that require a saturated zone in the soil profile within 60 inches of the surface in most years. A saturated zone lasting less than a month is not considered a water table. As indicated in Table 3.2-21, none of the soils in the project area are classified as having a high water table or seasonal flooding hazards.

**Protective/Mitigation Measures**

The following measure is included in Black Hills' proposal, to minimize impacts to soils:

- Storm water BMPs are included in the SWMP and will be implemented, such as run-on/run-off controls, swales, ditches or berms, sediment catchments and anchored erosion barriers such as erosion blankets or straw wattles to minimize erosion and sediment transport.

The following BLM GJFO Standard COAs would be required, to minimize impacts to soils:

- When saturated soil conditions exist on access roads or location, construction will be halted until soil dries or until activities can proceed without soil damage. No saturated or frozen topsoil will be stripped.
- At the time of construction, (well pads, pipelines, roads, or other surface facilities) topsoil will be stripped following vegetation removal. Topsoil will include all suitable growth medium present at a site, as indicated by color or texture - depths may vary across a site. Stripped topsoil and vegetation smaller than 4 inches in diameter will be segregated and stored separately from subsoils or other excavated material and replaced prior to final seedbed preparation.
- To facilitate its replacement, extend its biological viability and create a berm to control storm water, topsoil will be wind-rowed around pad perimeter wherever practical. Along pipelines and roads, topsoil will be wind-rowed, segregated and stored for later redistribution during reclamation.
- Cuts and fills will be minimized when working on erosive soils and on slopes in excess of 30 percent. Cut-and-fill slopes will be stabilized through revegetation practices with an approved seed mix shortly following construction activities, to minimize the potential for slope failures, erosion and soil loss. Fill slopes adjacent to drainages will be protected with BMPs designed to minimize sediment transport. On slopes greater than 50 percent, BLM may require a professional geotechnical analysis and/or engineered plans prior to construction.
- Within 30 days of completion of pad construction, topsoil storage berms, storm water control features, temporarily disturbed areas along roads and pipelines, and cut and fill slopes will undergo temporary seeding to stabilize materials, maintain biotic soil activities, and minimize weed infestations. Seedbed preparation may not be required for stored topsoil or other areas of temporary seeding.

In addition, the BLM would require the following, to further minimize impacts to soils:

- Areas proposed for disturbance with slopes greater than 40 percent should be evaluated during an on-site inspection (for proposed well pads HDU 24-11, WT 12-16, DC 1-13, HSC 5-16, HSC 1-20, HSC 1-22) and might require relocation.

- Exposed rock outcrops present in pipeline corridors or on proposed well pad locations should be removed intact, as possible (salvaging large pieces from the outcrop), and replaced on the ground surface at the margins of the corridor and/or as close to the original location as practical.

**No Action Alternative**

Under this alternative, no project-related impacts would occur to soils on BLM-administered lands from construction and operation of the Proposed Action.

**Finding on the Public Land Health Standard 1 (Upland Soils)**

With implementation of the proposed mitigation measures identified within this EA and by managing noxious weeds within the project area, current conditions related to assessment of Standard 1 might not be affected by the Proposed Action.

Under the No Action Alternative, effects from existing and new surface disturbances (unrelated to the Proposed Action) would continue and could affect Public Land Health Standard 1.

### 3.2.4 Water (Surface and Groundwater) (Includes a Finding on Standard 5)

#### 3.2.4.1 Current Conditions

Surface Water Hydrology

The project area is located in the Colorado Plateau Physiographic Province, where basins and the broad valleys of the middle Colorado River and its tributaries form an irregular intermontane topography (Robson and Banta, 1995). The uplift of the Colorado Plateau steepened stream gradients and accelerated the down cutting of the Colorado River and its principal tributaries.

The climate of the project area is characterized as semi-arid, where the average annual precipitation ranges from 10 to15 inches for most of the project area (Daly and Taylor, 2012). Thus, perennial (year-round) surface water flows only occur in the Colorado River, Roan Creek and Dry Fork, which have sources at high elevations to the north of the project area that receive more than 30 inches of annual precipitation. Flows in intermittent and ephemeral drainages within the project area occur in response to spring snowmelt and large summer and early autumn thunderstorms.

The U.S. Geological Survey (USGS) classifies watershed areas in the United States into successively smaller hydrologic units: regions, sub-regions, basins, subbasins, watersheds and subwatersheds. Each hydrologic unit is identified by a unique hydrologic unit code (HUC) consisting of two to twelve digits based on the six levels of classification in the hydrologic unit system. The project area is located in the Upper Colorado Region, Colorado Headwaters subregion and basin and Colorado Headwaters – Plateau (HUC14010005) subbasin (NRCS, 2012b).

There are nine subwatersheds within the project area (see Map 3.2-2) including:

- North Dry Fork Roan Creek (HUC 140100051003)
- South Dry Fork Roan Creek (HUC 140100051004)
- Dry Fork Roan Creek (HUC 140100051005)
- Outlet Roan Creek (HUC 140100051006)
- Coon Hollow (HUC 140100051405)
- Little Salt Wash (HUC 140100051608)
- Upper Jerry Creek (HUC 140100051408)
- Horseshoe Canyon – Colorado River (HUC 140100051406)
- Roberts Canyon – Colorado River (HUC 140100051407)

The characteristics of the subwatersheds are summarized in Table 3.2-22.

**Table 3.2-22**
**Characteristics of Subwatersheds in the Project Area**

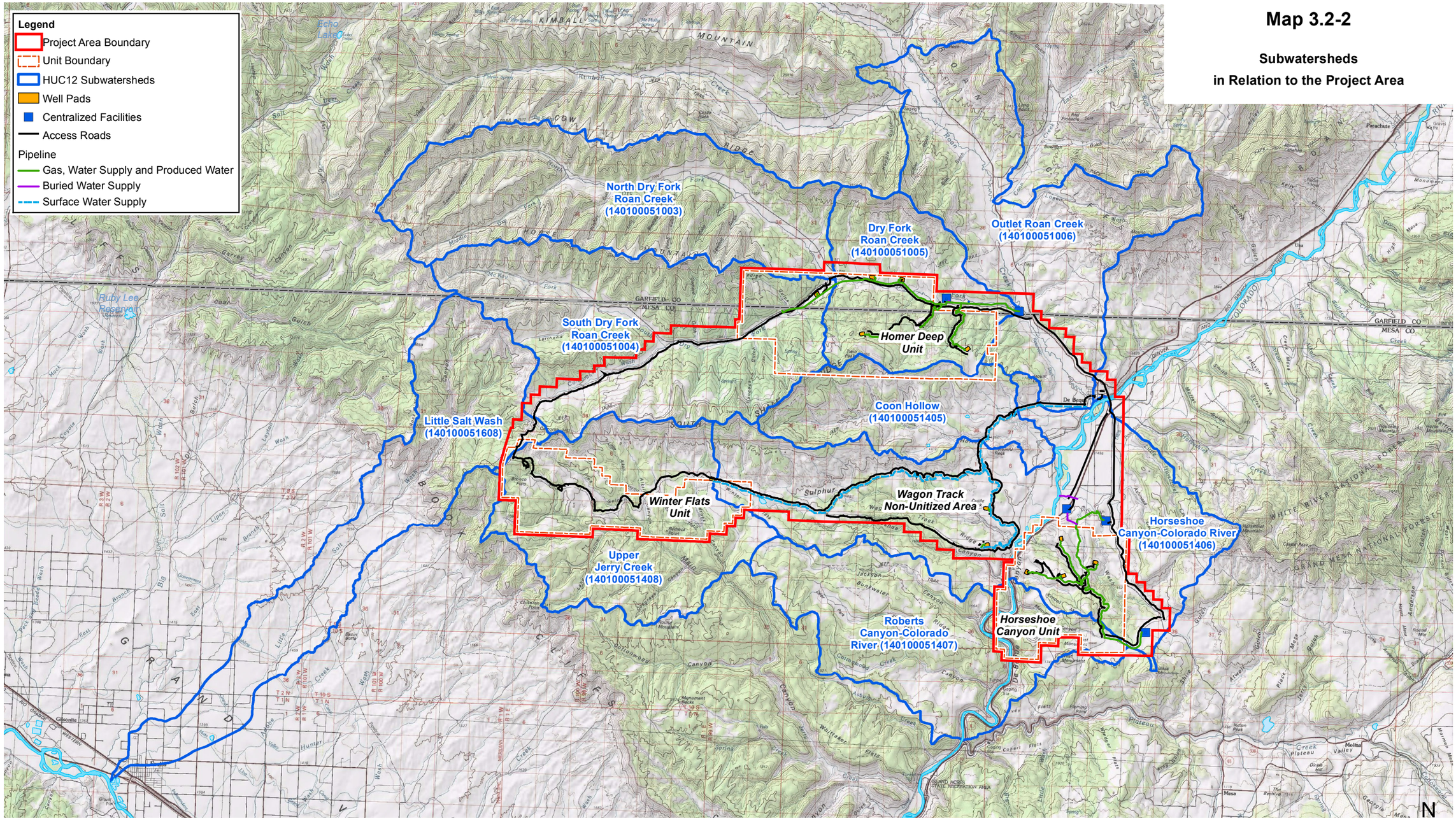
| Subwatershed Name | HUC 12 Number | Main Drainage Length (feet) | Main Drainage Max. Elevation (Feet amsl) | Main Drainage Min. Elevation (Feet amsl) | Main Drainage Average Gradient (%) | Subwatershed Area (acres) |
|---|---|---|---|---|---|---|
| North Dry Fork Roan Creek | 140100051003 | 83,510 | 8,428 | 5,600 | 3.4 | 26,758 |
| South Dry Fork Roan Creek | 140100051004 | 70,887 | 8,247 | 5,600 | 3.7 | 29,180 |
| Dry Fork Roan Creek | 140100051005 | 32,119 | 5,600 | 5,040 | 1.7 | 13,724 |
| Outlet Roan Creek | 140100051006 | 69,508 | 5,440 | 4,930 | 0.7 | 27,576 |
| Coon Hollow | 140100051405 | 60,904 | 7,922 | 4,870 | 5.0 | 11,270 |
| Little Salt Wash | 140100051608 | 105,614 | 8,270 | 4,460 | 3.6 | 22,848 |
| Upper Jerry Creek | 140100051408 | 45,114 | 7,616 | 5,635 | 4.4 | 21,959 |
| Horseshoe Canyon-Colorado River | 140100051406 | 67,124 | 8,028 | 4,845 | 4.7 | 37,919 |
| Roberts Canyon-Colorado River | 140100051407 | 64,871 | 6,680 | 4,780 | 2.9 | 20,927 |

Note: Drainage characteristics are for the most prominent drainage in each subwatershed; distances and elevations were estimated from USGS topographic maps.
HUC – Hydrologic Unit Code - 12 digit USGS number identifying subwatershed.

The subwatersheds and surface water features are shown on Map 3.2-2. South Dry Fork and North Dry Fork form Dry Fork Roan Creek downstream from their confluence. Dry Fork drains into Roan Creek, which drains into the Colorado River. North Dry Fork is categorized as a perennial stream (USGS, 2012a), but South Dry Fork has intermittent flows (USGS, 2012a). Dry Fork Roan Creek, the principal drainage in the Homer Deep Unit, has perennial flows. Additionally, there are numerous intermittent and ephemeral tributaries to Dry Fork, South Dry Fork and North Dry Fork.

## Map 3.2-2

**Subwatersheds in Relation to the Project Area**

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Middle Dry Fork is the main named tributary to North Dry Fork; other tributaries include Sawmill Gulch, Forshay Gulch, Lion Gulch, Bledsaw Gulch, Piling Gulch, Boldt Gulch and a second Sawmill Gulch. McKay Fork and Corcoran Wash are the main named tributaries to South Dry Fork; other tributaries include streams in Lefthand Draw, Gothard Gulch, Hancock Gulch and Pedigo Gulch. There are no named tributaries to Dry Fork Roan Creek.

Numerous springs are mapped in the North and South Dry Fork Roan Creek subwatersheds. One flow measurement for the North Dry Fork downstream from the confluence of Middle Dry Fork with North Dry Fork (USGS 392501108295700) from August 1975 indicates a flow of 0.8 cubic feet per second (cfs) (USGS, 2012b).

USGS data indicate that stream flows in the lower Dry Fork were perennial when data were collected at USGS Gage 09095400 from 1974 through 1982 (see Figure 3.2-2 and Adams et al., 1986). During that period, daily stream flow records indicate several instances of minimal flows during drought years in 1975 and 1977. The average daily flow for the period of record is 5 cfs, but peak flows as high as 784 cfs (Oct. 1974) have been recorded (USGS, 2012a). The lowest flows occur during the winter months (see Figure 3.2-2). Data for suspended sediment concentrations (SSC) in the Dry Fork that were collected simultaneously with flow data (discharge) indicate that there is a direct relationship between SSC and in-stream flow; i.e., higher sediment loads occur with higher flows (USGS, 2012b). Streamflows in the upper Dry Fork are also perennial in most years, as measured at USGS Gage 09095300; however, during the summers from 2001-2004, flows were minimal or non-existent for some weeks. The average daily flow for the period of record from 1996 through 2004 is 2 cfs, but peak flows as high as 2,660 cfs (Aug. 2001) have been recorded (USGS, 2012b).

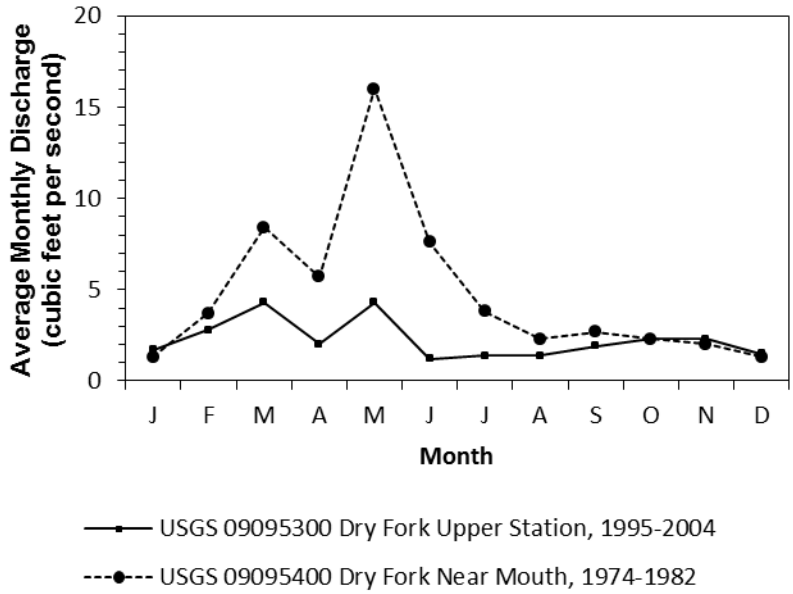



**Figure 3.2-2**
**Average Monthly Flows in the Dry Fork**

The source of Roan Creek is north of the project area. Roan Creek has numerous named and unnamed tributaries upstream of the confluence with Dry Fork Roan Creek. The downstream part of the Roan Creek Outlet subwatershed, downstream of the confluence with Dry Fork, is adjacent to the Homer Deep Unit and contains the proposed HD CF#2. Two main access roads to the project area also traverse the Roan Creek Outlet subwatershed. Roan Creek is perennial, with flows measured between 1 cfs (Oct. 2003) and 45 cfs (Nov. 1983) at its mouth before the

confluence with the Colorado River (USGS, 2012b). Flows are highest in the spring, during snow melt, and are lower during the irrigation season, when flows are diverted into diversion ditches. Roan Creek Ditch Number 2 and Reservoir Ditch start on Roan Creek just downstream of the confluence with Dry Fork Roan Creek. There are numerous unnamed tributaries to Roan Creek downstream of the confluence with Dry Fork Roan Creek, but there are no named tributaries.

The Coon Hollow subwatershed is located south of the Dry Fork Roan Creek subwatershed. Several unnamed intermittent and ephemeral tributaries drain into the main Coon Hollow drainage, which drains into the Colorado River just downstream of Roan Creek. The main Coon Hollow drainage is also intermittent. No flow or water quality data are available for this watershed.

Main Canyon is the primary drainage in the Winter Flats area (see Map 3.2-2). Tributaries to Main Canyon include streams in Pine Gulch, Little Alkali and Alkali Canyon, Lane Gulch, Cosgrave Canyon and Redrock Canyon. Main Canyon is an ephemeral tributary to the Colorado River. No flow or water quality data are available for this watershed. The Pine Ridge fire in early July 2012 did not burn any portion of the Winter Flats area.

The Little Salt Wash subwatershed also drains into the Colorado River. Only one intermittent tributary to Little Salt Wash (Hunter Canyon) collects drainage from a portion of the Winter Flats Unit and is traversed by the existing access road.

Both the Wagon Track Non-Unitized Area to the west of the Colorado River and the Horseshoe Canyon Unit to the east of the Colorado River are located within the Horseshoe Canyon–Colorado River subwatershed (see Map 3.2-2). Multiple tributaries to the Colorado River with intermittent flows are included in this subwatershed, including Little Horsethief Creek, Ashmead Draw and Sand Wash on the southeast, and Sulphur Gulch and Horseshoe Canyon on the northwest. Reservoir Ditch continues from Roan Creek into the Horseshoe Canyon – Colorado River subwatershed, and Larkin Ditch and Bluestone Valley Ditch are on the southeast side of the Colorado River (see Map 3.2-2). In 2012, the Pine Ridge fire burned lower portions of the Sulphur Gulch and Horseshoe Canyon drainages to their confluences with the Colorado River altering historic surface hydrology in those areas.

The southern part of the Horseshoe Canyon Unit Area is located in the Roberts Canyon–Colorado River subwatershed. Intermittent tributaries to the Colorado River included in this subwatershed flowing from the southeast are located in Monument Canyon and other unnamed drainages; and include Cottonwood Creek, Ashbury Creek and a tributary in Jackson Canyon draining from the northwest. Flow measurements for the Colorado River are available for USGS gage 09095500, Colorado River near Cameo, which has ongoing measurements beginning in 1933. The average monthly flows for the period of record are shown in Figure 3.2-3. The highest average flows occur in May and June, with lower flows occurring during the winter months.

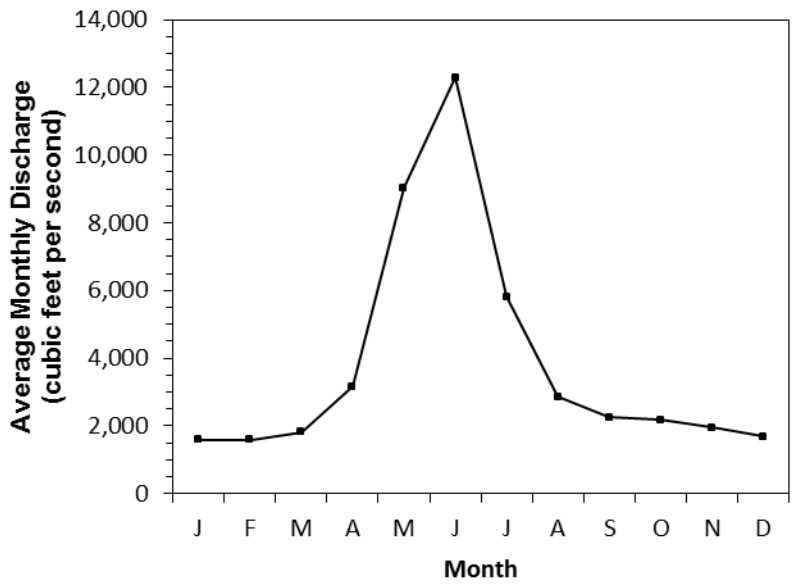



**Figure 3.2-3**
**Average Monthly Flows in the Colorado River**
**Measured at USGS Gage 09095500 (1933 through 2011)**

Groundwater

The major regional aquifer system in the project area is the Colorado Plateau aquifer system which stretches across northern Arizona, western Colorado, northwestern New Mexico and eastern Utah. The Colorado Plateau aquifers are contained in a thick sequence of poorly to well-consolidated conglomerate, sandstone, siltstone and shale. Other formations consisting of volcanic rock, carbonate rock and evaporite deposits in the area might also yield water to wells. Structural deformation, faulting and lateral changes in the lithology of the rocks have produced a complex sequence of water-yielding strata (Robson and Banta, 1995).

The Mesaverde aquifer, part of the Colorado Plateau aquifer system, is the major bedrock aquifer in the southern half of the project area. In the project area, the Mesaverde Group predominantly consists of sandstone with interbedded shale and coal (Robson and Banta, 1995).

The Uinta-Animas aquifer part of the Colorado Plateau aquifer system is the major bedrock aquifer in northern half of the project area, overlaying the Mesaverde aquifer. The Uinta-Animas aquifer primarily is composed of Lower Tertiary aged strata of the Uinta Formation and the Parachute Creek Member of the Green River Formation. The Uinta Formation consists of silty sandstone, siltstone and marlstone. Much of the intergranular space in these rocks has been filled by sodium and calcium bicarbonate cements, but fractures are numerous and produce substantial permeability. The Parachute Creek Member primarily consists of dolomitic marlstone. The lower part of the Green River Formation and the Wasatch Formation form most of the lower confining unit of the aquifer (Robson and Banta, 1995).

Substantial usable groundwater resources in the project area are contained in Quaternary alluvium in valleys within the Roan Creek watershed. Most of the alluvial groundwater is recharged from snowmelt at higher elevations. Precipitation occurring as a result of convective summer thunderstorms can also be a substantial source of groundwater recharge to ephemeral stream channels and near stream alluvial deposits. The valley fill alluvium in the Roan and

Upper Jerry Creek subwatersheds consists generally of unconsolidated gravel, sand and silt, with occasional boulders which have rolled off the cliffs of the plateau. Based on valley profiles, the alluvium in Roan Creek may be as thick as 100 feet. The depth to water in shallow wells in the alluvial aquifer along Roan Creek downstream from its confluence with Dry Fork ranges from 11 to 41 feet (USGS, 2012b). Substantial groundwater is also found in the alluvium along the Colorado River. In one well (USGS Well No. 391905108135901) located near the Colorado River above Coon Hollow, the depth to water is 33 feet, the well is 300 feet deep and it is completed in alluvium and terrace deposits. Colorado River alluvium is sandy gravel of substantial width in the Horseshoe Canyon subwatershed of the Colorado River, but has limited extent in DeBeque Canyon in the Roberts Canyon subwatershed of the Colorado River (Topper et al., 2003), where the river is incised across the west flank of the Piceance structural basin.

Surface Water Quality

Surface water quality depends on natural and anthropogenic factors, including geology, precipitation, vegetation cover and land use. The geology within a watershed is a key determinant of its surface water quality. In areas with outcrops of sandstone, basalt, or granite, the surface water tends to be of good quality. Where the Morrison, Mancos, Wasatch and Green River formations are exposed, water quality tends to be poorer, with high total dissolved solids and/or selenium concentrations. Selenium derived from marine shales is a leading cause of water quality impairment to surface water in western Colorado. Precipitation patterns also influence water quality. Most rainfall in the project area occurs in the form of isolated, short-duration and intense summer thunderstorms, creating localized flood flows that have the power to erode, mobilize and transport sediment downstream. This sediment is then transported to streams and can increase salinity and selenium concentrations in surface water (BLM, 2009a).

Vegetation helps prevent the detrimental effects that precipitation has on surface water quality. A diverse and abundant vegetation cover is better able to stabilize the soil, minimizing soil erosion, sediment transport and deposition in nearby streams. Vegetation reduces soil loss by minimizing raindrop impact, slowing runoff velocities and allowing more percolation of rainwater and saturating the soil to further enhance vegetative growth in a positive feedback cycle (BLM, 2009a).

The CDPHE Water Quality Control Commission (WQCC) classifies stream segments according to river basin and specific water segments (CDPHE, 2012a). All surface waters within Colorado are organized by basin and labeled by stream segment. For each stream segment, the State has set water quality standards for physical, chemical and biological parameters based on the existing or potential beneficial uses for water supply, aquatic life, recreation and agriculture.

The Colorado River near the project area is part of the Lower Colorado River Basin water quality stream segment 2a. Roan Creek and all its tributaries are part of the Lower Colorado River Basin water quality stream segment 14c. All other tributaries to the Colorado River, including wetlands, from a point immediately below the confluence of Roan Creek to the Colorado/Utah border are part of the Lower Colorado River Basin water quality stream segment 13a.

Water quality standards and guidance for drainages within the Lower Colorado basin are included in the CDPHE WQCC Regulation No. 37 (CDPHE, 2012b). A brief description of the classifications is provided in Table 3.2-23.

**Table 3.2-23**
**Beneficial Use Classifications for Potentially Affected Streams**

| Stream Segment Description | Classifications* |
|---|---|
| **BASIN: LOWER COLORADO RIVER** | |
| **2a**. Mainstem of the Colorado River from immediately below the confluence with Rifle Creek to immediately above the confluence of Rapid Creek. | Aquatic Life Warm 1<br>Recreation E<br>Water Supply<br>Agriculture |
| **14c**. Mainstem of Roan Creek including all tributaries and wetlands, from a point immediately below the confluence with Kimball Creek to the confluence with the Colorado River. | Aquatic Life Warm 1<br>Recreation P<br>Water Supply<br>Agriculture |
| **13a**. All tributaries to the Colorado River including wetlands, from a point immediately below the confluence of Roan Creek to the Colorado/Utah border. | Aquatic Life Warm 2<br>Recreation P<br>Agriculture |

* Class 1 - Warm Water Aquatic Life. These are waters that (1) currently are capable of sustaining a wide variety of warm water biota, including sensitive species, or (2) could sustain such biota but for correctable water quality conditions. Waters shall be considered capable of sustaining such biota where physical habitat, water flows or levels and water quality conditions result in no substantial impairment of the abundance and diversity of specifies.

* Class 2 – Cold and Warm Water Aquatic Life. These are waters that are not capable of sustaining a wide variety of cold or warm water biota, including sensitive species, due to physical habitat, water flows or levels, or uncorrectable water quality conditions that result in substantial impairment of the abundance and diversity of species.

* Recreation Class P - Potential Primary Contact Use. These surface waters have the potential to be used for primary contact recreation. This classification shall be assigned to water segments for which no use attainability analysis has been performed demonstrating that a recreation class N classification is appropriate, if a reasonable level of inquiry has failed to identify any existing primary contact uses of the water segment, or where the conclusion of a UAA is that primary contact uses may potentially occur in the segment, but there are no existing primary contact uses.

* Recreation Class E - Existing Primary Contact Use. These surface waters are used for primary contact recreation or have been used for such activities since November 28, 1975.

* Domestic Water Supply. These surface waters are suitable or intended to become suitable for potable water supplies. After receiving standard treatment (defined as coagulation, flocculation, sedimentation, filtration and disinfection with chlorine or its equivalent), these waters will meet Colorado drinking water regulations and any revisions, amendments, or supplements thereto.

* Agriculture. These surface waters are suitable or intended to become suitable for irrigation of crops usually grown in Colorado and which are not hazardous as drinking water for livestock.

Source: CDPHE, 2012b.

The Clean Water Act (EPA, 1972) requires states to compile a list of water bodies, known as the 303(d) list, that do not fully support their designated uses. The CDPHE WQCC Regulation 93, Colorado's Section 303(d) list of impaired waters, indicates that sediment and selenium are the primary water quality impairments in the Colorado River drainage (CDPHE, 2012a). A portion of the mainstem of the Colorado River, segment COLCLC02b, (Humphrey Backwater area, 28 river miles downstream from the Roan Creek confluence), is on Colorado's Monitoring and Evaluation List for sediment and is listed as impaired under Colorado's Section 303(d) list of impaired waters for selenium (CDPHE, 2012a). Dry Fork Roan Creek, segment COLCLC14c is

also listed as impaired under Colorado's Section 303(d) list of impaired waters for selenium (CDPHE, 2012a).

The standard for selenium for tributaries to the Colorado River (Segment 13a, Table 3.2-23 Beneficial Use Classifications for Potentially Affected Streams) in the project area according to the CDPHE WQCC (2012b) is 20 micrograms per liter (µg/L). Table Value Standards for selenium for the mainstem of the Colorado River (Lower Colorado River Segment 2a) and for Roan Creek and all its tributaries (Lower Colorado River Segment 14c) are 18.4 µg/L for acute toxicity and 4.6 µg/L for chronic toxicity. A complete listing of numeric standards for physical, biological, inorganic and metal parameters for these segments can be found in CDPHE (2012b).

Limited surface water quality data is available for segments 2a, 13a and 14c. Water quality data were collected for several springs in the South Dry Fork Roan Creek subwatershed. Selenium concentrations were measured at four spring monitoring locations (USGS 392228108343701, USGS 392213108314801, USGS 392210108300300 and USGS 392110108260601) between 1975 and 1982 for a total of six measurements. The average selenium concentration for these samples is 5 µg/L.

In the North Dry Fork Roan Creek subwatershed, selenium concentrations were measured at five spring monitoring locations (USGS 392445108311201, USGS 392510108253001, USGS 392446108250202, USGS 392328108223301 and USGS 392247108214500) as well as at one station in North Dry Fork (USGS 392501108295700) between 1975 and 1982 for a total of nine measurements. The average selenium concentration for these samples is 3 µg/L, but a maximum value of 12 µg/L was found in one spring.

One spring (USGS 392209108155600) in the Dry Fork Roan Creek subwatershed had a selenium concentration of 19 µg/L in one measurement in 1975. Water quality data were collected by the USGS in Dry Fork Roan Creek near the mouth (USGS 09095400) from 1975 through 1983. Water quality concentrations for major ions and selected metals measured in Dry Fork Roan Creek during that time period are included in Table 3.2-24. In general, the water in Dry Fork Roan Creek is of sodium sulfate type with high specific conductance.

**Table 3.2-24**
**Water Quality Parameters Measured**
**in Dry Fork Roan Creek between 1974 and 1983**

| | | | | Values in µg/l | | | | |
|---|---|---|---|---|---|---|---|---|
| | **pH (field)** | **Conductance (µS/cm)** | **Hardness (mg/L $CaCO_3$)** | **Arsenic (dissolved)** | **Selenium (total)** | **Manganese (total)** | **Aluminum (dissolved)** | **Iron (dissolved)** |
| USGS 09095400 Dry Fork, 1975 through 1983 (USGS, 2012b) | | | | | | | | |
| Number of Samples | 20 | 75 | 16 | 12 | 3 | 3 | 4 | 12 |
| Average | 8.4 | 2,183 | 711 | 4 | 3 | 93 | 75 | 31 |
| Minimum | 8.1 | 950 | 390 | 1 | 2 | 30 | 10 | 10 |
| Maximum | 9.0 | 4,200 | 1,300 | 6 | 4 | 170 | 210 | 60 |
| USGS 393042108274000 Dry Fork at Mouth Nov. 14, 1974 (single measurement) (Adams et al., 1986) | | | | | | | | |
| Value | 8.1 | 590 | 340 | | 1(diss) | | | 40 |
| BLM Lower Dry Fork (T8S R98W section 12 NW SW) July 27, 2011 (single measurement) | | | | | | | | |
| Value | 8.4 | 2070 | 725 | 4.5 | 3.3 (diss) | 6 (diss) | 630 (tot) | 0 |

Limited river and stream water quality data has been collected by the CDPHE and EPA (EPA, 2012) from monitoring stations on Roan Creek and the USGS (2012b) as summarized in Table 3.2-25. The stations are located in Roan Creek below the confluence of Dry Fork which receives runoff from the Homer Deep Unit. Roan Creek water is classified as sodium-sulfate type, with concentrations of metals similar to Dry Fork Roan Creek.

No water quality sampling data is available for Jerry Creek.

Water quality measurements for selenium in the Horseshoe Canyon-Colorado River subwatershed have been collected in 2002 at the mouth of Sulphur Gulch (USGS 391607108153500), which is the drainage that drains the Wagon Track Non-Unitized Area. The selenium concentrations for two measurements recorded at this location in March 2002 were 11 and 3 µg/L (USGS, 2012b).

**Table 3.2-25**
**Water Quality Parameters Measured in Roan Creek**

| | | | | Values in µg/l | | | | |
|---|---|---|---|---|---|---|---|---|
| | **pH (field)** | **Conductance (µS/cm)** | **Hardness (mg/L Ca + Mg)** | **Arsenic (dissolved)** | **Selenium (dissolved)** | **Manganese (dissolved)** | **Aluminum (dissolved)** | **Iron (dissolved)** |
| 148 Roan Creek Near De Beque, 1979 – 2007 (EPA, 2012) | | | | | | | | |
| Number of Samples | 87 | 84 | 76 | 14 | 16 | 41 | 19 | 35 |
| Average | 8.3 | 1,882 | 690 | 2 | 3 | 91 | bdl | bdl |
| Minimum | 7.6 | 670 | 290 | bdl | bdl | bdl | bdl | bdl |
| Maximum | 9.7 | 5,050 | 1,720 | 3 | 4 | 470 | bdl | 37 |
| 11201 Roan Creek Near De Beque at 44 Rd., 2007-2008 (EPA, 2012) | | | | | | | | |
| Number of Samples | 3 | 3 | 3 | - | 3 | 3 | 1 | 3 |
| Average | 8.3 | 1,829 | 607 | | 2.0 | 138 | bdl | 1,379 |
| Minimum | 7.9 | 1,061 | 490 | | 1.5 | 38 | | 14 |
| Maximum | 8.7 | 2,777 | 820 | | 2.4 | 330 | | 4,100 |
| 11202 Roan Creek N of De Beque at County Hwy 222, 1995 – 1996 (EPA, 2012) | | | | | | | | |
| Number of Samples | 10 | - | 10 | 9 | 10 | 10 | - | - |
| Average | 8.4 | | 650 | 2 | 3 | 63 | | |
| Minimum | 8.0 | | 200 | 3 | 1 | 14 | | |
| Maximum | 8.6 | | 1,100 | 2 | 4 | 190 | | |
| USGS 391953108130201 Roan Creek at De Beque, Nov. 15 1983 (single measurement) (USGS, 2012b) | | | | | | | | |
| Value | 8.5 | 1,510 | 513 (as $CaCO_3$) | 3 | - | 10 | - | bdl |
| USGS 391949108130101 Roan Creek at De Beque Sept. 4 1983 (single measurement) (USGS, 2012b) | | | | | | | | |
| Value | 8.3 | 2,640 | 850 (as $CaCO_3$) | 2 | - | 60 | - | 30 |
| USGS 391944108130201 Roan Creek at Mouth Near De Beque, Co Oct. 23 1983 (single measurement) (USGS, 2012b) | | | | | | | | |
| Value | - | 3,130 | - | | - | - | - | - |
| USGS 392205108153301 Roan Creek Below Dry Fork DUP2, Nov. 15 1983 (single measurement) (USGS, 2012b) | | | | | | | | |
| Value | 8.3 | 1,450 | 485 (as $CaCO_3$) | 3 | - | 10 | - | bdl |
| Roan Creek near De Beque, September 17, 2009 (BLM, 2010) | | | | | | | | |
| Value | 8.17 | 2,024 | 739 | 1.1 | 1.7 | 20 | 393 | 67 |
| bdl- below detection limit.<br>Source: (EPA, 2012c and USGS, 2012b). | | | | | | | | |

Groundwater Quality

Most of the springs and seeps sampled by the USGS are discharging from the Quaternary System local aquifer (USGS, 2012b). Thus, they are assumed to be representative of the water

quality for the alluvial aquifers. One spring (USGS 392110108260601) in Gothard Gulch in the South Dry Fork Roan Creek subwatershed discharges from the Green River Formation local aquifer, and one spring on the north tributary to South Dry Fork Roan Creek (USGS 392124108244701) discharges from the Wasatch Formation local aquifer (USGS, 2012b).

Based on data collected by the USGS (2012b) for the spring in South Dry Fork Roan Creek (USGS 392110108260601) from 1981 through 1982, the water in the Green River Formation is sodium sulfate type with a specific conductance of 2,322 microsiemens per centimeter (µS/cm). Based on data for 1982 from the USGS (2012b) the Wasatch Formation spring (USGS 392124108244701) has similar water quality and is sodium sulfate type, with a specific conductance of 2,220 µS/cm. The water in springs from the alluvial aquifer is either of sodium bicarbonate or sodium sulfate type, with varying conductance.

Based on data collected by the USGS (2012b) from 1978 through 1979, water in wells in the alluvial aquifer along Roan Creek below Dry Fork has a specific conductance ranging from 2,900 to 4,500 µS/cm and is sodium-sulfate type. The water in one well (USGS 391926108175401) in the alluvial aquifer in the Coon Hollow subwatershed has a specific conductance of 900 µS/cm and is sodium-bicarbonate type.

Deeper water-bearing strata generally have poorer water quality (Robson and Banta, 1995).

Water Rights

The Colorado Decision Support System was reviewed to identify water rights within and adjacent to the project area (Colorado Department of Natural Resources, Division of Water Resources – CDNR-DWR, 2012a and 2012b). Table 1 in Appendix H provides a list of all active water rights within the project area and within 5 miles of the unit boundaries (excluding water rights in subwatersheds that do not intersect the unit boundaries. There are 168 permitted rights that fit the above criteria including 58 ditches, 39 reservoirs, 33 springs, 15 wells, 8 pumps, 6 measuring points, 6 augmentation plans, 2 pipelines and 1 minimum streamflow site.

Water Wells

As of September 2012, 60 current water well permits are located within the project area and/or within 5 miles of the unit boundaries (excluding water wells that are in subwatersheds that do not intersect the unit boundaries). Twenty-eight of the water wells are permitted for domestic/household use, 24 are for industrial/commercial use, one for irrigation, one for augmentation and six are classified as other (CDNR-DWR, 2012c). Well permit details are summarized in Table 2 in Appendix H.

The USGS (2012b) measured depth to water in 19 wells near the project area between 1978 and 1979. The wells are listed in Table 3.2-26. The depth to water in wells in the alluvial aquifer along Roan Creek below Dry Fork ranges from 11 to 41 feet, with a maximum well depth of 61 feet.

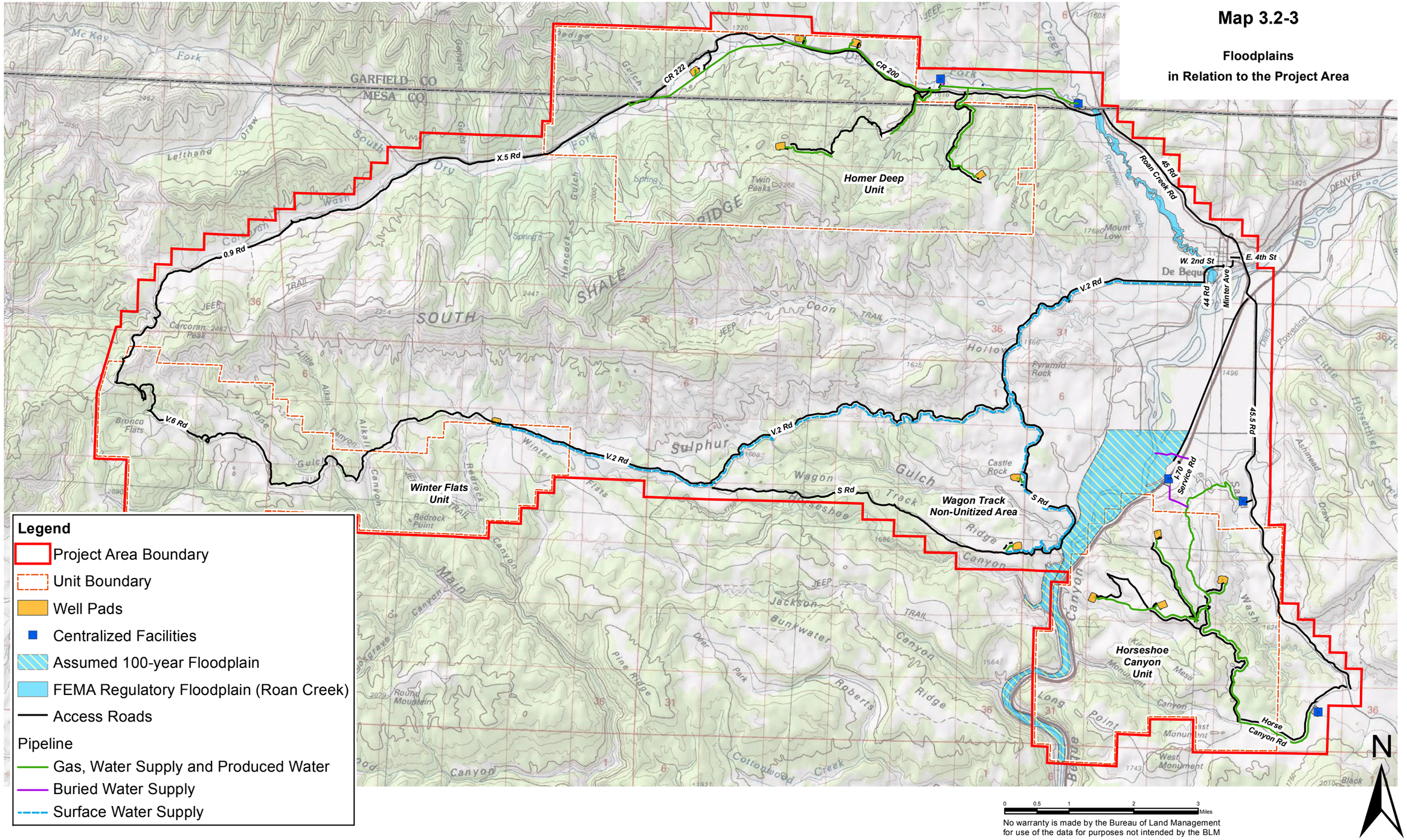
**Table 3.2-26**
**USGS Sampled Water Wells within the Project Area and within a 5-mile Radius**

| USGS Site Number | Site Name | Location | Well Depth (feet) | Depth to Water (feet) |
|---|---|---|---|---|
| 391905108135901 | SC00809732ADD1 | Colorado River above Coon Hollow | 304 | 33 |
| 391906108161801 | 044 WEB PLACE WELL | Coon Hollow | | |
| 392125108150101 | SC00809717CBC1 | Roan Creek below Dry Fork | 46 | 41 |
| 392127108145901 | SC00809717CBC2 | Roan Creek below Dry Fork | 54 | 32 |
| 392128108145703 | SC00809717CBD1 | Roan Creek below Dry Fork | 54 | 27 |
| 392129108145701 | SC00809717CBA8 | Roan Creek below Dry Fork | 47 | 26 |
| 392129108145702 | SC00809717CBA2 | Roan Creek below Dry Fork | 49 | 26 |
| 392131108145101 | SC00809717CBA7 | Roan Creek below Dry Fork | 40 | 20 |
| 392131108145401 | SC00809717CBA2 | Roan Creek below Dry Fork | 49 | 20 |
| 392131108145901 | SC00809717CBB1 | Roan Creek below Dry Fork | 46 | 27 |
| 392132108145201 | SC00809717CBA17 | Roan Creek below Dry Fork | 40 | 15 |
| 392132108145202 | SC00809717CBA5 | Roan Creek below Dry Fork | 40 | 14 |
| 392132108145301 | SC00809717CBA4 | Roan Creek below Dry Fork | 42 | |
| 392132108145302 | SC00809717CBA6 | Roan Creek below Dry Fork | 40 | 16 |
| 392134108145001 | SC00809717CBA3 | Roan Creek below Dry Fork | 39 | 11 |
| 392138108144501 | SC00809717BDC1 | Roan Creek below Dry Fork | 39 | 16 |
| 392154108151401 | SC00809718AAB1 | Roan Creek below Dry Fork | 41 | 35 |
| 392231108153203 | SC00809707ACC1 | Roan Creek above Dry Fork | 61 | |
| 392242108213701 | SC00809807AAD | Confluence of North and South Dry Fork | 61 | |

Floodplains

The 100-year floodplain (areas subject to inundation by the 1-percent-annual-chance flood event) has been mapped by the Federal Emergency Management Agency (FEMA) along Roan Creek within Mesa County (FEMA, 2012). Map 3.2-3 shows the floodplain along Roan Creek.

The Colorado River flows through portions of the project area including the Wagon Track and Horseshoe Canyon areas (see Map 3.2-3). Although the river's floodplain within the project area has not been mapped by FEMA, it is apparent that the floodplain has been restricted by protective armoring for Interstate-70 on the east side and an elevated berm with railroad tracks used by Burlington Northern-Santa Fe and Amtrak railroads on the west side. Vegetation on the floodplain in both areas is dominated by shrubs including black greasewood, tamarisk, Russian olive, with some willows and cottonwoods. Floodplains are of limited extent in the general project area. Roan Creek and Jerry Creek and their tributaries are undersized streams in steep young canyons. The Colorado River is incised through DeBeque Canyon with no substantial development at river level. Upstream from DeBeque Canyon to the confluence of Roan Creek, it is assumed that the current 100-year floodplain extends between Interstate-70 on one side and the railroad berm on the opposite side of the river. The same pattern of floodplain extending to the railroad berm is apparent north of the project area on maps prepared during a 1982 study conducted by the USACE (1982) in Garfield County. Map 3.2-3 shows the assumed current and historic 100-year floodplain within the project area.


Map 3.2-3
Floodplains
in Relation to the Project Area
Legend
Project Area Boundary
Unit Boundary
Well Pads
Centralized Facilities
Assumed 100-year Floodplain
FEMA Regulatory Floodplain (Roan Creek)
Access Roads
Pipeline
Gas, Water Supply and Produced Water
Buried Water Supply
Surface Water Supply
Homer Deep Unit
Winter Flats Unit
Wagon Track Non-Unitized Area
Horseshoe Canyon Unit
CR 222
CR 200
X.5 Rd
0.9 Rd
V.6 Rd
V.2 Rd
S Rd
45 Rd
Roan Creek Rd
W. 2nd St
E. 4th St
44 Rd
Minter Ave
45.5 Rd
I-70 Service Rd
Horse Canyon Rd
GARFIELD CO
MESA CO
De Beque
N
0 0.5 1 2 3 Miles
No warranty is made by the Bureau of Land Management
for use of the data for purposes not intended by the BLM

**Public Land Health Standard 5 (Water Quality)**

Standard 5 - The water quality of all water bodies, including ground water where applicable, located on or influenced by BLM lands will achieve or exceed the Water Quality Standards established by the State of Colorado.

Land Health Assessments for the DeBeque/Roan Creek landscape area were completed in 2004 (BLM, 2009a). Within the project area, the BLM determined (2009a, Table 3-1) that about seven stream miles along the length of Corcoran Wash, a tributary of South Dry Fork are not meeting the state water quality standard for selenium. The selenium is derived from the marine shale geology in the watershed; elevated concentrations in surface water occur primarily from irrigated agriculture and sediment erosion.

The Dry Fork tributary of Roan Creek is currently on the State 303 (d) list of impaired water bodies for selenium. Much of the length of Dry Fork and its tributaries are privately owned and irrigated. Large sections of North Dry Fork have been modified to consist of a series of man-made impoundments. Irrigation withdrawal and return have greatly modified Dry Fork flows. Dry Fork is on the 303(d) list of impaired water bodies for selenium. The source of selenium pollution is primarily leaching from irrigated private land on Mancos Shale (Mt. Garfield Formation, Mesaverde Group) and Wasatch Formation-derived soils. BLM-permitted grazing, oil and gas development, recreation and other surface-disturbing activities may contribute to elevated selenium levels, but the extent to which BLM-permitted activities contribute to the selenium pollution is unquantified. Because Dry Fork is listed for selenium impairment and because the BLM maintains management presence in the watershed, Standard 5 is currently not being met for water quality (BLM, 2009a).

### 3.2.4.2 Environmental Consequences

**Proposed Action Alternative**

Surface Water Hydrology

The construction and operation of well pads, pipelines, roads and centralized facilities has the potential to cause erosion and affect surface water resources. Impacts to surface water quantity and flow would be greatest during construction and might occur because of water diversions, surface disturbance and grading, vegetation clearing, landform modification and earth movement. Water diversions and consumptive use of fresh water for drilling, completion, testing and general construction could dewater area streams (specifically Dry Fork). Dewatering streams such as the Dry Fork (which already has limited flow) could compromise the health of riparian habitat which provides habitat for aquatic species (such as BLM sensitive Northern Leopard Frogs), bank stability and helps filter water quality contaminants before entering surface waters. Reduced bank stability could result in further morphologic destabilization and continued loss of stream function.

Road and well pad construction could also increase soil compaction. The construction of road or well pad subgrades and surfaces typically decreases soil permeability, reduces soil infiltration and can increase runoff. Increased runoff has greater potential to erode hill slopes, stream banks and stream channels. Limiting surface disturbance to the least amount necessary for construction and not disturbing any areas outside the staked construction disturbance limits would minimize impacts. To minimize erosion from storm water runoff, Black Hills would adhere to their respective SWMPs, prepared in accordance with state regulations and Gold Book Standards (BLM and Forest Service, 2007). Gold Book Standards include drainage control, which is required over all roads through the use of drainage dips, in-sloping, natural rolling topography, ditch turnouts, ditches, or culverts. Existing access roads would be upgraded and maintained to prevent soil erosion and accommodate year-round traffic.

Impacts to surface water flow and quality could also result from surface short-term discharge of pipeline hydrostatic test water; however, implementation of BMPs could minimize these impacts. BMPs to reduce erosion potential include the utilization of discharge structures (filter bag or straw bale) that would dissipate water velocity and filter out total dissolved solids. With implementation of the above measures, impacts to water quantity and flow could be minimal and short-term. Black Hills would follow the BLM GJFO Standard COAs as they apply to construction; however, there could be potential temporary to short-term impacts to surface water associated with the Proposed Action at crossings of streams and municipal ditches even with BMPs in place.

Surface Water Quality

Impacts to surface water quality could occur as a result of road and pipeline construction, including surface disturbance and grading, vegetation clearing, landform modification and earth movement. Specifically, these activities can mobilize sediment and increase salinity. Salinity represents the presence of elevated levels of soluble salts in surface waters. These salts are generally sodium chloride, magnesium and calcium sulfates and bicarbonates. Salinity is typically associated with sediment, as the ions bind to soil particles. Salinity is one of the greatest water quality concerns within the Colorado River Basin and is subject to the Colorado River Basin Salinity Control Act (PL 98-569) (U.S. Bureau of Reclamation - BOR, 1984).

The Dry Fork tributary of Roan Creek is currently on the State 303 (d) list of impaired water bodies for selenium. Much of the length of Dry Fork and its tributaries is privately owned and irrigated. The source of selenium pollution is primarily leaching from irrigated private land on Mancos Shale (Mt. Garfield Formation, Mesaverde Group) and Wasatch Formation-derived soils (see Section 3.2.4.3 below and BLM 2009a). More than 90 percent of all proposed surface disturbances would be to selenium-containing (seleniferous) and salt bearing geologic strata including the Hunter Canyon Formation, the Wasatch Formation and recent alluvial deposits and landslides. Runoff from these strata has been related to elevated loads of salt and selenium concentrations in the Upper Colorado River Basin (Lieb et al., 2012).

Existing roads, rather than new construction, would be used to the extent possible to access proposed well pads. The main access roads to all of the exploration areas currently exist as described in the Transportation Plan. New road construction would be required for short resource roads from existing local roads to proposed well pads. No new roads would cross drainages. Most of the existing access roads to individual well pads would require improvements. Examples of road improvements include grading, re-routing, installation of culverts and armoring streambed crossings. Several of the proposed improved roads would cross drainages and streams including the proposed access road to Homer Deep pad HDU 7-23. Other access roads proposed for improvement would cross unnamed ephemeral drainages in the Homer Deep and Horseshoe Canyon units. The proposed new and improved roads and proposed pipeline crossings of streams and drainages are listed in Table 3.2-27.

**Table 3.2-27**
**Stream Crossings under the Proposed Action**

| Description | Streams Crossed (Hydrographic Category[1]) |
|---|---|
| **Access Roads Proposed for Upgrade** | |
| Access road to well pad HDU 7-23 | South Dry Fork (intermittent) |
| Access road to well pad HDU 17-43 | tributary to Dry Fork (intermittent) |
| Access road to well pad HDU 24-11 | four tributaries to Dry Fork (all intermittent) |
| Access road to well pad HSC 1-20 | tributary to the Colorado River (Intermittent) |
| Access road to all well pads in Horseshoe Canyon Unit | tributary to Sand Wash (intermittent) |
| **Access Roads and Well Pads proposed for New Construction** | |
| Well pad WF 10-31-99 | ditch flowing toward Soap Reservoir (intermittent) |
| Well pad HSC 1-21 | tributary to the Colorado River (intermittent) |
| Well pad HSC 1-22 | tributary to Sand Wash (intermittent) |
| **Proposed Gas, Water Supply and Produced Water Pipelines** | |
| Homer Deep pipeline from HDU CF#2 to existing well on South Dry Fork near Pedigo Gulch | South Dry Fork (intermittent) |
| | Pedigo Gulch (intermittent) |
| | two tributaries to South Dry Fork (both intermittent) |
| | four crossings of Dry Fork (all perennial) |
| | 15 tributaries to Dry Fork (all intermittent) |
| Pipeline to HDU 17-43 (parallel to access road with improvements) | tributary to Dry Fork (intermittent) |
| Pipeline to HDU 24-11 (parallel to access road with improvements) | four tributaries to Dry Fork (all intermittent) |
| Pipeline from HSC CF#2 to HSC 5-16, 1-21 and 1-20 (parallel to access road with improvements) | tributary to Sand Wash (intermittent) |
| Pipeline from HSC CF#1 to HSC 1-22 | Sand Wash (intermittent) |
| | two drainages flowing into Bluestone Valley Ditch (several times) (both intermittent) |
| **Proposed Surface Water Pipelines** | |
| Winter Flats Pipeline from DeBeque to WF 10-31-99 | two tributaries to Horseshoe Canyon Draw (both intermittent) |
| | Sulphur Gulch and eight tributaries to Sulphur Gulch (all intermittent) |
| | six drainages flowing to a tributary of the Colorado River in DeBeque Canyon (all intermittent) |
| | three drainages in Coon Hollow subwatershed (all intermittent) |
| | three drainages flowing to a tributary of the Colorado River north of Coon Hollow (all intermittent) |
| | Reservoir Ditch (intermittent) |
| Wagon Track Pipeline from the Winter Flats Pipeline to well pad DC 1-13 | five drainages to the Colorado River (all intermittent) |
| **Proposed Water Supply Pipelines** | |
| From Colorado River to Larkin Ditch | Ashmead Draw (intermittent) |
| | Sand Wash (intermittent) |
| From Larkin Ditch to Pipeline from HSC CF#1 | drainage flowing into Bluestone Valley Ditch (several times) (all intermittent) |

Source: USGS, 2012a.
[1] Hydrographic Categories defined in the National Hydrography Dataset, USGS, 2013.

Potential for sedimentation to surface water resources increases during construction, during drilling and well completion and at affected stream crossings. Sediment transport from disturbed areas near streams could be actuated during high precipitation and flow events and enter adjacent drainages or ditch areas, until disturbed areas are completely stabilized by reclamation. Possible effects could include increased erosion and stream sedimentation, due to changes in channel morphology associated with clearing and grading of stream banks, placement of fill for access roads in stream channels, installation of culverts and armored streambed crossings, in-stream trenching for gathering line placement and trench backfilling.

Near-surface soil compaction caused by construction equipment activity could reduce the soil's ability to absorb water and could increase surface runoff and the potential for ponding. The potential for sediment transport would increase in unnamed ephemeral drainages in the Homer Deep and Horseshoe Canyon units. Impacts could be limited if construction were timed to avoid periods of flow in those drainages.

Gathering pipelines for gas, water supply and produced water would be constructed along access roads to the greatest extent possible. The proposed gas, water supply and produced water pipeline between the eastern boundary of the Homer Deep Unit and proposed HDU CF#2 would follow existing road CR 200 only for parts of its alignment. The pipeline corridor would cross the South Dry Fork and Dry Fork, a perennial stream, in several locations. The proposed gas, water supply and produced water pipeline alignment from the Horseshoe Canyon Unit to the Horseshoe Canyon centralized facilities would follow an unnamed ephemeral tributary to Sand Wash, which drains into the Colorado River. Potential for sediment transport would increase during construction phases for all pipelines. The construction phase has the greatest potential for impact to surface water quality, after which prompt and successful reclamation would minimize sediment yield and mobility. In the long term, quick establishment of a healthy and diverse vegetation community would lower impacts to surface water quality.

To minimize erosion and sedimentation from storm water runoff, Black Hills would implement the previously described measures and follow the BMPs included in their respective SWMPs. Storm water BMPs would be designed to manage a 25-year event or greater. Storm water control and BMPs would be designed and applied based on site-specific conditions and included on well-site grading plans (Appendix G). Storm water flow originating off a pad would be routed around it, to prevent it from running onto pads. Impacts to surface water quality would also be reduced by limiting surface disturbing to within 100 feet of perennial streams to only essential roads and utility crossings, as well as by limiting construction activities at ephemeral drainage crossings to periods when there is no flow. All road and pipeline construction and maintenance would follow Gold Book Standards (BLM and Forest Service, 2007). Road maintenance and road and pipeline reclamation would also follow Gold Book Standards or BLM GJFO Standards COAs. Black Hills would comply with BLM GJFO Standard COAs regarding construction in wetlands and WoUS.

The following measures, agreed to during on-site inspections, would be implemented at these pads:

- Well pad HDU 17-43 would incorporate existing Maralex pad SSR 9-7. Black Hills would cap and dismantle the existing Maralex well and infrastructure. The existing road to SSR 9-7 would be reclaimed and culvert removed. All disturbance and permanent BMPs would be at a horizontal distance of least 30 feet from the adjacent stream and the pad and BMP disturbances would be located outside the steep slopes forming the drainage.
- Well pad HDU 9-41 would be located on a level to gently sloping area adjacent to Garfield CR 200 and would require a new short access spur from an existing spur road. The pad would be located to avoid affecting an ephemeral drainage to the west side and rainfall-driven sheet flow from the north would be managed with BMPs.
- Well pad HDU 9-11 would be located on a level to gently sloping area in a similar topographic area, again adjacent to Garfield CR 200. It would require a new short access spur road. Again, storm water sheet flow from the north would be controlled with BMPs.

- Well pad HDU 7-23 is proposed adjacent to existing Maralex well pad SSR 10-7, off Garfield CR 222. The area where the pad is proposed is relatively flat, on a bench above and just south of the intermittent stream South Dry Fork. Small, ephemeral tributaries cross the proposed pad disturbance as they run toward the stream. One such drainage consists of an unvegetated erosional feature developing from a head-cut. It runs north rather than east-northeast, as do the other ephemeral tributaries. None of these ephemeral drainages has any notable catchment area above it. As drawn by the surveyor, the closest point of disturbance relative to the stream would be about 85 feet. However, Black Hills and the BLM would require that at least 100 feet of vegetated and undisturbed ground remain between the creek and any project disturbance. New pad disturbance would stay as near to adjacent Maralex pad SSR 10-7 as possible. The existing access road that would serve both pads would be improved, especially at the existing low water crossing of South Dry Fork. Black Hills would design and engineer a box culvert or bridge to cross South Dry Fork where the access road crosses it. It would be designed to manage at least a 50-year storm event. If a box culvert design was selected, a spillway to carry water and debris over it, for larger than 50-year storm events would be included in the design so that debris and water could flow over the culvert without it jamming and creating additional sediment. A Nationwide permit with the USACE would be required. The BLM hydrologist and Black Hills discussed and agreed to this at the on-site inspection on July 24, 2012.
- Well pad WF 10-31-99 is proposed adjacent to Mesa County V.2 Road and a man-made canal diverting intermittent flow from the north to the BLM range improvement Soap Reservoir, where livestock and wildlife come to drink. Also adjacent is a drainage flowing intermittently into BLM's Winter Flats Pond. Neither canal would be expected to be affected by the proposed pad construction and operation. The site-specific SWMP and BMPs help to minimize any impact from surface flow to the ponds.

With implementation of the above measures, impacts to surface water resources could be minimal and short-term.

Surface water quality could also be impacted by inadvertent spills of fuel, lubricants, or solvents. The potential for adverse impacts to surface waters also increase when produced water is loaded-out and transported to water handling sites and/or from the water handling sites to the injection well. All spills would be contained and cleaned up in accordance with measures described in the SPCC Plan.

Impacts to surface water quality could also occur from the use of water for dust control on roads if application of water created run-off. Discharge of trench dewatering water or hydrostatic test water could impact surface water quality unless it was discharged appropriately, with site-specific BMPs and with prior BLM approval.

Groundwater Hydrology

Shallow alluvial groundwater flow would be impacted if proposed pipeline trenching intersected a shallow groundwater table. If shallow groundwater was encountered during construction, the trench might be dewatered to prevent instability. If required, the water would be pumped to an upland area where it would be allowed to infiltrate back to the shallow groundwater system. Trench plugs installed to keep seasonal high groundwater levels that might rise into the open trench from flowing down it. The deep groundwater system could be affected by drawdown effects from pumping of produced water during drilling or groundwater mounding during injection well operations.

Spring flows emanating from alluvial or shallow aquifers would likely not be impacted, as surface casing would be installed during well drilling to a minimum depth of 100 feet below any known fresh water aquifers within a one-mile radius of the drilled well, to protect the alluvial and other fresh water aquifers. Flood flows in ephemeral washes are also important and substantial sources of groundwater recharge for alluvial aquifers in the project area. Water withdrawal could reduce the volume of recharge available for alluvial aquifer systems, which could then result in reduced base flows in Dry Fork and Roan Creek.

Groundwater Quality

Accidental spills of fuel, lubricants, solvents, drilling fluids, fracking fluids, produced water, condensate and other harmful chemicals could impact shallow alluvial groundwater if spills were allowed to infiltrate into the soil. Protocols and measures described in SPCC Plans are designed to minimize leaks and spills and make sure that containment and cleanup are quick and adequate, should spills occur. When implemented appropriately, such measures can minimize groundwater contamination. Strict adherence to the required reporting, control and mitigation measures would help minimize impacts. All production facilities (storage tanks, loadouts, separators, treating units, etc.) with the potential to leak or spill oil, condensate, produced water, glycol, or other fluid that could potentially reach groundwater or surface water would be placed within secondary containment structures. Berms and containment structures would be designed and constructed to prevent movement of fluids through them into the soils and groundwater. Secondary containment structures would be sized to hold a minimum of 110 percent of the storage capacity of the largest tank within the berm. All loading lines would be kept inside the containment berm. Chemical containers would be clearly labeled, maintained in good condition and placed within secondary containment structures. They would not be stored on bare ground, nor exposed to sun or moisture.

Produced water found to be unacceptable for recycling would be disposed of in the existing Black Hills Hancock Gulch #1 injection well located in the Homer Deep Unit (see Figure 3.2-2). No new impacts are expected from this injection well permitted and operating since 2010.

If a well had a faulty annular cement seal, hydrocarbons could migrate from the gas producing zone and impact groundwater resources. To minimize the possibility of this happening and to protect project area groundwater resources, drilling would be conducted in compliance with all BLM Onshore Oil and Gas Orders (BLM, 2005), Gold Book Standards (BLM and Forest Service, 2007), the BLM GJFO Standard COAs and COGCC Rules (2012a). As agreed to on the July 24, 2012 on-site inspection, Black Hills would collect baseline water quality data in Dry Fork of Roan Creek (or shallow well such as a sand point) specifically looking for total petroleum hydrocarbons (TPH), BTEX (benzene, toluene, ethyl benzene and xylene), and VOCs for proposed well pad locations HDU 9-41, HDU 9-11 and HDU 7-23.

Hydrocarbon reservoir stimulation might be required after the well is completed in order to optimize well production. The typical method used for hydrocarbon reservoir stimulation is hydraulic fracturing in which sand and fluids with a chemical composition specific to a particular well are pumped into the producing formation with sufficient pressure to fracture the producing rock formation. The sand grains prop the created fractures open and allow reservoir fluids to move more efficiently into the well bore. The depths of the shallowest production zones and potential hydraulic fracturing intervals are expected to be between about 3,000 and 8,000 feet below the ground surface (bgs) (COGCC, 2012b). The average depth of water wells in the project area is 150 feet bgs, two wells are greater than 500 feet bgs and the deepest is 565 feet bgs. The minimum thickness of the strata between the bottom of the deepest existing water well and the top of the shallowest potential hydraulic fracturing zone range from 1,435 feet in the Winter Flats Unit to 3,035 feet in the Homer Deep Non Unit (see Table 3.2-28).

The interval of strata between the bottom of the deepest water wells and the shallowest potential hydraulic fracturing zones is comprised of the Wasatch and Mesaverde formations. In the project area, the Wasatch Formation consists primarily of interbedded claystone, shale, siltstone and sandstone. The Mesaverde Formation consists primarily of interbedded sandstone, shale, coal and mudstone (Hail and Smith, 1997). This interval of low permeable strata between the area water wells and the shallowest hydraulic fracturing zone expected in the proposed oil and gas wells should prevent hydraulic communication and potential contamination of area water wells. No fault zones that could create groundwater or natural gas flow paths are known (Hail and Smith, 1997).

**Table 3.2-28**
**Comparison of Project Area Water Wells and Gas Well Depths**

| Federal Lease Unit Name | Minimum Production Zone Depth (ft)[1] | Maximum Water Well Depth (ft)[2] | Minimum Interburden Thickness (ft) | Interburden Fm |
|---|---|---|---|---|
| Homer Deep | 3,200 | 565 | 2,635 | Wasatch and Mesaverde |
| Homer Deep Non-Unit | 3,600 | 565 | 3,035 | Wasatch and Mesaverde |
| Winter Flats | 2,000 | 565 | 1,435 | Wasatch and Mesaverde |
| Wagon Track Non-Unit | 2,100 | 565 | 1,535 | Wasatch and Mesaverde |
| Horseshoe Canyon | 2,500 | 565 | 1,935 | Wasatch and Mesaverde |

[1] Minimum production zone depth based on the expected formation top for the Cameo Coal zone. (COGCC, 2012b).
[2] The deepest existing domestic water well in the project area is 565 feet bgs (CDNR-DWR, 2012c).

Water Rights

Short-term impacts related to storm water from new construction could degrade water quality which may affect downstream users. However, with successful implementation of storm water BMPs these impacts could be mitigated. Direct impacts to water delivery infrastructure (e.g., diversion points, ditches or pipelines) could adversely affect uses associated with those water rights. Water diverted out of priority would adversely impact downstream senior users. However, Black Hills would obtain water in priority from legal means. Downstream water rights are not expected to be depleted. Likewise, impacts to water rights relying on alluvial aquifers in the Roan Creek area (including Dry Fork) are unlikely, since proposed diversion points would be downstream of them. However, diversions could reduce the volume of recharge to alluvial aquifers and in this way could impact water rights that rely on this groundwater or on base flows in the receiving stream.

Black Hills proposes to obtain water for drilling, completion, dust control and hydrostatic testing by purchasing 500 acre-feet of water rights from the Colorado River Water District annually for the life of the project. No other water rights would be affected.

Floodplains

Two project access roads cross the Roan Creek floodplain. Garfield CR 200 crosses Roan Creek below its confluence with Dry Fork. Mesa County 44 Road, just outside De Beque crosses Roan Creek above its mouth.

A water supply pipeline is proposed within the assumed 100-year Colorado River floodplain in Section 9 (T 9S, R 97W). The pipeline would extend for 0.40 mile between Interstate-70 and the Colorado River and is proposed at a disturbance width of 50 feet. Disturbance within the

assumed floodplain would be 2.42 acres which would be reclaimed immediately after construction. No proposed well pads, centralized facilities, or roads would occur within regulatory or historic floodplains. Access roads currently crossing the Roan Creek floodplain would not be modified. If mitigation measures and BMPs were effective, no additional impact to floodplains might be expected as a result of the Proposed Action.

**Protective/Mitigation Measures**

The following measures are included in Black Hills' proposal, to minimize impacts to hydrology and water quality:

- Drilling would use a closed loop drilling system. Drilling fluids would be transferred to tanks and hauled off site to an approved disposal facility. Cuttings would be disposed of on-site in accordance with BLM and COGCC regulations. The fluids pit would initially contain fresh water used for drilling and completion and be continually refilled with fresh water as needed. During well completion, flowback water from hydraulic fracturing operations would be introduced and held in the fluids pit. Before introduction into the pit, the flowback water would undergo a separation process to remove hydrocarbons. No oil would be expected to be in the fluids pit. Concentrations of solids in the pit fluids would increase as pit water evaporated. The fluids pit would be double-lined, with both liners a minimum thickness of 24 mil and would be installed in accordance with COGCC rules (2012a).
- Surface casing would be installed to a minimum depth of 100 feet deeper than any freshwater aquifer located within one-mile of the well. The borehole would be cased with steel and cemented in place entirely from ground level to a depth determined for each well and included in that well's APD.
- Prior to drilling below the surface casing, a BOP would be installed on the surface casing and both the BOP and the surface casing would be tested for pressure integrity. BOPs and related equipment are required to meet the requirements of Onshore Oil and Gas Order No. 2 (BLM, 2005). The BLM would be notified in advance of all pressure tests and test results would be recorded and reported to the BLM.
- After drilling the borehole to its final depth, geophysical logging tools would be run into the well to evaluate potential hydrocarbon resources. If hydrocarbon resources were present, adequate and recoverable, steel production casing would be run and cemented into place in accordance with the well design approved by the APD.
- The proposed production casing and cementing protocols would be designed to protect and/or isolate all usable groundwater zones, lost circulation zones, abnormally high pressured zones and any prospectively valuable deposits of minerals. Approval from the BLM would be required prior to the use of any medium other than cement for sealing the well annulus between the production casing and borehole.
- After production casing was cemented, the drill rig would be removed and a completion rig would take its place. Well completion would include running a cement bond log to evaluate cement integrity and to correlate cased borehole logs with open borehole logs. The steel production casing would be perforated across the hydrocarbon-producing zones and the formation would then be stimulated to enhance oil and gas production.
- Details would be provided on every chemical's supplier, its purpose, ingredients, the Chemical Abstract Service (CAS) number, the maximum concentration in the additive and the maximum concentration in the hydraulic fracturing fluid, along with specific

details for each well, including total depth and water volume, per COGCC rules (COGCC, 2012a).

- Dry or non-producing wells would be plugged, abandoned and reclaimed within 90 days of well completion, weather permitting. After abandonment, each borehole would be plugged, capped and its related surface equipment removed. A Sundry Notice would be submitted to the BLM, with details of engineering, technical and/or environmental aspects of final plugging and abandonment. A well configuration diagram, a summary of plugging procedures and a job summary with techniques used to plug the wellbore (e.g., cementation) would be included in the Sundry Notice. Proposed final reclamation plans would also be included in the Sundry Notice. Well abandonment procedures would follow the BLM GJFO Standard COAs and COGCC rules (COGCC, 2012a).
- The SWMP and SPCC Plan would be carried out, to minimize impacts to water quality.

The following BLM GJFO Standard COAs would be required, to minimize impacts to hydrology and water quality:

- Pads, roads, and pipelines would be located away from defined drainages where possible. In areas where construction is located within 100 feet of a drainage, an adequate vegetative buffer, artificial buffer (e.g., straw bales, matting, etc.), or filter strip would be maintained between the constructed feature road and the drainage, to minimize sediment transport into the drainage.
- All vehicles would be fueled at least 100 feet from stream corridors.
- Any construction at perennial, intermittent and ephemeral drainage crossings (e.g. burying pipelines, installing culverts) would be timed to avoid high flow conditions. The minimum culvert diameter in any installation for a drainage crossing or road drainage would be 24 inches. Culverts on perennial and intermittent streams would be designed to allow for passage of aquatic biota. Culverts at drainage crossings would be designed and installed to pass, without development of a static head at the pipe inlet, at least a 25-year storm event, but may be deemed to require additional culvert design capacity. Due to the flashy nature of area drainages and anticipated culvert maintenance, the USACE recommends designing drainage crossings for the 100-year event. Contact the USACE Colorado West Regulatory Branch at 970-243-1199.
- Fluids will be confined to pits or tanks during air drilling, flaring or fracturing operations. Flare or blooey lines will be directed into a pit and against a bank to prevent dispersion of materials or flame. Any blooey line will be misted to prevent dispersion of materials.
- All pits that may contain liquid material will be lined to prevent seepage into the ground. The pit liner will be maintained in good working condition, with no tears or holes, until the pit is closed.
- Pits will be constructed to preclude the accumulation of precipitation runoff and maintain a minimum of 2 feet of freeboard between the maximum fluid level and the lowest point of containment. If pit fluids threaten to rise to a level above that, the operator will immediately prevent introduction of additional fluids until sufficient pit capacity has been restored through fluid removal or will install an alternative approved containment method.

In addition to the measures described above, the BLM would require the following, to further minimize potential impacts to hydrology and water quality.

- If hydrostatic test water or trench dewatering water is discharged, it should be discharged to an upland area at least 150 feet from WoUS and wetlands, in a manner so that it would infiltrate into the ground without causing erosion. BLM approval of the discharge location and proposed BMPs should be obtained before discharging hydrostatic test water to an upland area.
- Pipeline construction across ephemeral and intermittent drainages should occur when no flowing water is present.
- Drainages and drainage patterns should be evaluated before or during on-site inspections for proposed well pads HDU 24-11, WT 12-16, DC 1-13, HSC 5-16, HSC 1-20 and HSC 1-22. Well pad locations and orientations should be adjusted to minimize effects to drainages and water flow.
- A box culvert or bridge should be engineered and installed for the South Dry Fork crossing along the well pad HDU 7-23 access road. The design should pass a 50-year event and withstand the 100-year flood event. For the box culvert, a spillway should be included so debris and water could flow over the culvert without creating additional sediment, in case of a major water event.
- For proposed well pads HDU 9-41, HDU 9-11 and HDU 7-23, baseline water quality data should be collected in Dry Fork of Roan Creek (or shallow well such as a sand point) specifically looking for TPH, BTEX and VOCs. At the time of APD submission, Surface Use Plans of Operation (SUPOs) should also indicate that the baseline water quality will be collected. Baseline samples should be collected during low flow periods (e.g., late fall) prior to construction. Analytical parameters should include: pH, alkalinity, specific conductance, major cations/anions chloride, fluoride, sulfate, sodium, BTEX compounds, TPH, polycyclic aromatic hydrocarbons (PAHs) (including benzo(a)pyrene), metals (arsenic, barium, calcium, chromium, iron, magnesium and selenium). Follow-up sampling should occur within 6 to 12 months from the start of drilling. Subsequent samples should be collected between 60 to 72 months of completion. Permits should be obtained through the State of Colorado for monitoring wells. Data should be provided directly to the BLM from the laboratory conducting the analysis (see COGCC rule 609 and amended rule 318A.e.(4)).
- Black Hills should fund the installation, observation and maintenance of a real-time stream gaging station (USGS operated gage preferable) installed below the proposed diversion on Dry Fork of Roan Creek. The following represent limiting volumes:
    - 1.4 cubic feet per second from March 1 through May 31. This creek experiences consistently low flows during late summer and fall, so it is important to protect as much physical habitat as possible during the limited time when snowmelt runoff flows are available.
    - 1.2 cubic feet per second from June 1 to November 30. This flow rate is capable of maintaining pool habitat in the creek and preventing excessively high temperatures.
    - 1.05 cubic feet per second from December 1 to February 28. This flow rate should provide sufficient flow to prevent pools from freezing and protect overwintering fish.

- Store and stage emergency spill response equipment at strategic locations along perennial water courses so that it is available to expedite effective spill response.
- Avoid locating staging, refueling and storage areas within 300 feet of any reservoir, lake, wetland, or natural perennial or seasonally flowing stream or river.
- Avoid constructing any road segment in the channel of an intermittent or perennial stream.
- Avoid low water crossings. Structures for perennial or intermittent stream channel crossings should be engineered using bridges or appropriately sized culverts.
- Pipelines that cross perennial, intermittent and ephemeral stream channels should be constructed to withstand floods of extreme magnitude to prevent rupture and accidental contamination of runoff during high flow events. Methods and analysis outlined in BLM technical note 423-Hydraulic Considerations for Pipelines Crossing Stream Channels (DOI, 2007) should be closely followed to prevent undesirable events.
- A copy of the SPCC Plan should be provided to the BLM with the APD submittal.

**No Action Alternative**

Under this alternative, no project-related impacts to surface water, groundwater, water rights, or floodplains would occur on BLM-administered land resulting from the Proposed Action.

**Finding on the Public Land Health Standard 5 (Water Quality)**

The mainstem of the Colorado River is also on the State 303 (d) list of impaired water bodies for selenium. Selenium is associated with sediment runoff in water, which is caused by erosion. Land use disturbances, such as grazing, energy development and surface-disturbing activities included in the Proposed Action, that occur in marine-derived shale soils increase dissolved materials in river systems as a result of increased erosion and sediment transport. With implementation of BMPs and the use of the proposed protective measures, the Proposed Action might not be likely to further deteriorate water quality in these streams.

Under the No Action Alternative, effects from existing and new surface disturbances (unrelated to the Proposed Action) would continue and could affect Public Land Health Standard 5.

### 3.2.5 Noise

#### 3.2.5.1 Current Conditions

Noise measurements are not available for the project area. Local conditions such as traffic, topography, and high winds characteristic of the region can alter background noise conditions. In general, sound levels (decibels – dB) at outdoor rural residential locations are about 40 dB, averaged for day and night periods (see for example, EPA, 1974). With existing levels of vehicular traffic, natural resource development and ranching activities in the Homer Deep Unit, Winter Flats Unit and Wagon Track Non-Unitized Area, average ambient noise levels are expected to be in the range of 35 to 45 dB and probably near an average of 40 dB for day and night conditions.

Interstate-70 is within 0.75 mile of the Wagon Track Non-Unitized Area and passes through the northwest portion of the Horseshoe Canyon Unit. An average of 16,000 vehicles per day (including 2,330 trucks per day) utilized that portion of the interstate in 2011 (see Table 3.4-4). Noise produced by traffic, with volume of 1,000 vehicles per hour, traveling at speeds of 75 miles per hour (60 miles per hour for trucks), is estimated at 74.2 dBA 50 feet away from the

highway (Table 7-3 in Washington State Department of Transportation-WSDOT, 2011a). Noise from interstate traffic would attenuate to background levels farther than 1.8 miles from the highway and be audible in all or portions of the Wagon Track Non-Unitized Area and Horseshoe Canyon Unit. Vehicle noise on local roads would be limited to sound generated by individual vehicles such as a pickup truck or flatbed truck (Table 3.2-29).

### 3.2.5.2 Environmental Consequences

**Proposed Action Alternative**

The Proposed Action would increase local noise levels during construction and operation. Noise levels 50 feet away from typical construction equipment used to construct well pads, pipelines and roads, including upgrading of existing roads, are provided in Table 3.2-29. Included are distances for noise to attenuate to background ambient levels under hard site surface conditions (including bare ground, rock, pavement) and soft site conditions (roughened ground, vegetated surfaces.

**Table 3.2-29**
**Average Maximum Noise (Lmax) at 50 feet from Construction Equipment and Estimated Distance to Attenuate to Background [1]**

| Construction Activity | Equipment | Noise dBA (Lmax measured) at 50 feet) [2] | Distance (feet) to Attenuate to Assumed Ambient Noise Level of 40 dBA[1] | |
|---|---|---|---|---|
| | | | Soft Site Reduction at 7.5 dBA per double of distance | Hard Site Reduction at 6 dBA per double of distance |
| Clearing and Grading | Grader | 85 | 3,200 | 9,051 |
| | Scraper | 84 | 2,917 | 8.063 |
| | Warning Horn | 83 | 2,660 | 7,184 |
| | Dozer | 82 | 2,425 | 6,400 |
| | Excavator | 81 | 2,211 | 5,702 |
| | Backhoe | 78 | 1,676 | 4,032 |
| | Pickup Truck | 75 | 1,270 | 2,851 |
| | Flatbed Truck | 74 | 1,158 | 2,540 |
| Rock Excavation | Blasting (mitigated rock fracturing) | 94 | 7,352 | 25,600 |
| | Mounted Impact Hammer | 90 | 5,080 | 16,127 |
| | Auger Drill Rig | 84 | 2,917 | 8.063 |
| | Rock Drill | 81 | 2,211 | 5,702 |
| Stationary Equipment | Pneumatic Tools | 85 | 3,200 | 9,051 |
| | Generator | 81 | 2,211 | 5,702 |
| | Air Compressor | 78 | 1,676 | 4,032 |
| | Welder Torch | 74 | 1,158 | 2,540 |

[1] WSDOT, 2011a.
[2] Federal Highway Administration, 2006.

Well pad construction could require 7 to 10 days; drilling would require 45 days; completions would take from 14 to 21 days (see Table 2.2-6 in Chapter 2). Noise from typical construction machinery ranges from 74 to 85 dBA; sound pressures would increase if rock excavation is required. Drilling noise levels would depend on types of rigs and applied horsepower. On natural gas well pads, diesel-powered generators produce the highest noise levels, ranging from 100 to 102 dBA at 10 feet (86 to 88 dBA at 50 feet) while drilling rig noise ranges from 85 dBA to peak break noise levels of 105 dBA at 10 feet (71 to 91 dBA at 50 feet) (Behrens and Associates, 2006).

Noise 50 feet away from a 3,000 hp natural gas compressor (for example, the Solar Centaur 40 Compressor), for an unenclosed unit under full load operating conditions, was 89 dBA but would be 93 dBA when operating under a less than full load, due to the partially opened bleed valve (Solar Turbines, Inc., 2005). However, noise 50 feet away from the compressor combustion

exhaust would be 91 dBA and 119 dBA 50 feet from the combustion air inlet if those sources are unsilenced (Solar Turbines, Inc., 2005).

The Noise Control Act of 1972, as amended by the Quiet Communities Act of 1978 (42 USC 4901 et seq.), delegates the authority to regulate noise to the states and directs government agencies to comply with local noise regulations. Colorado has a regulation specifying quantitative limits on noise (CRS 25-12-103). Table 3.2-30 lists the noise limits in Colorado's Noise Abatement Law.

**Table 3.2-30**
**Colorado Limits on Maximum Permissible Noise Levels[1]**

| Land Use Zone | Maximum Permissible Noise Level[2] (dBa) | |
|---|---|---|
| | 7:00 am to 7:00 pm[3] | 7:00 pm to 7:00 am |
| Residential/Agricultural/Rural | 55 | 50 |
| Light industrial | 70 | 65 |
| Industrial | 80 | 75 |

[1] Source: CRS 25-12-101 et seq.
[2] Noise levels from oil and gas facilities located on surface property owned, leased or otherwise controlled by the operator shall be measured at three hundred and fifty (350) feet or at the property line, whichever is greater.
[3] In the hours between 7:00 a.m. and the next 7:00 p.m. the noise levels permitted may be increased 10 dBA for a period not to exceed 15 minutes in any one hour period. The allowable noise level for periodic, impulsive or shrill noises is reduced by 5 dBA from the levels shown.

COGCC Amended Rules (800 Series–Aesthetic and Noise Control Regulations) include section 802-Noise Abatement requirements for oil and gas operations at well sites, production facility, or gas facility which applies the noise limits of the state's Noise Abatement Law. The law and COGCC rules require oil and gas operations at any well site, production facility, or gas facility to comply with the maximum permissible noise levels in Table 3.2-30. COGCC rules allow operations involving pipeline or gas facility installation or maintenance, the use of a drilling rig, completion rig, workover rig, or stimulation to be subject to the maximum permissible noise levels for industrial zones.

Several residences and Agricultural Land Use Zone properties occur in the vicinity of proposed well pads, roads and centralized facilities. Noise generated during grading and clearing of surfaces by equipment included in Table 3.2-29 (maximum estimated 85 dBA) and maximum drilling noise of 91 dBA at 50 feet would attenuate to 80 dBA during daytime hours at nearest residences within Agricultural Land Use Zones. Well drilling/completion and compressor operations are assumed to generate the same level of noise over a 24-hour period. Compressor-related noise would be dependent on specific machines used in the field. For the example provided of noise produced by a Solar Centaur 40 Compressor Unit and from various sources on the unit, maximum allowable noise levels could be exceeded for industrial zones in Table 3.2-30 allowed under CRS 25-12-103 and COGCC Amended Rules (800 Series) at HDU CF#2 and HSC CF#2. Noise generated by different compressor manufacturers and models, if used in the project area, would have to be similarly evaluated.

Noise generated from construction, drilling, and completion would decrease in the production phase during which project-related noise would be due to vehicles on access roads and compressor noise at HDU CF#2 and HSC CF#2.

**Protective/Mitigation Measures**

The BLM would require the following measures, to reduce impacts from noise:

- Construction should occur during daytime hours when there is less sensitivity to sound.

- All equipment should have sound control devices no less effective than those provided by the manufacturer. All equipment should have muffled exhausts.
- If necessary, for greater noise reduction, moveable paneled noise shields, barriers, or enclosures should be installed adjacent to or around noisy equipment where required to meet the project noise limits. Temporary barriers can result in a noise reduction of up to 10 dBA at the receptor.
- Generator(s) serving drilling rigs should be installed and operated at the site in a manner that, at a minimum, meets the COGCC's Noise Abatement regulation (No. 802) for Residential/Agricultural/Rural Zone. This regulation requires that the noise level not exceed 50 dbA (Table 3.2-30).
- The use of engine braking by trucks should not be allowed on BLM roads.

**No Action Alternative**

Under this alternative, noise levels in the project area would exceed average ambient noise levels in the range of 35 to 45 dB due to local vehicular traffic, natural resource development and ranching activities. Noise levels in the Wagon Track Non-Unitized Area and the Horseshoe Canyon Unit would continue to be dominated by vehicular traffic noise on Interstate-70. There would not be additional noise due to surface clearing, grading, well drilling and completions, or due to additional field compressor units.

## 3.3 BIOLOGICAL RESOURCES

### 3.3.1 Invasive, Non-native Species

#### 3.3.1.1 Current Conditions

Several lists of noxious weeds are identified under the Colorado Noxious Weed Act (Title 35, Article 5.5). The "A" list includes species in Colorado that the Department of Agriculture Commissioner designates must be eradicated. Alternatively, "B" listed species are those designated by the Commissioner (in consultation with the state noxious weed advisory committee, local governments and other interested parties) for inclusion in state noxious weed management plans designed to stop the continued spread of these species. "C" listed species are also designated for state noxious weed management plans to support control and weed management on private and public lands by local governments with the goal of providing additional education, research and biological control resources to jurisdictions that choose to require management of List C species (Colorado Department of Agriculture, 2012).

No A-listed species were found within the project area, but B- and C-listed species were observed (see Table 3.3-1). Six B-listed species occur within project area; the most common is tamarisk, followed by jointed goatgrass. Seven C-listed species are also present, the most ubiquitous of which is cheatgrass. Some of the same 13 state-listed species present in the project area are on the Mesa County noxious weed list (Mesa County, 2009) and the Garfield County noxious weed list (Garfield County, 2011).

**Table 3.3-1**
**Noxious Weeds and Non-Native Plant Species Observed in the Project Area**

| Common Name<br>Scientific Name | Mesa County Noxious Weed List [2] | Garfield County Noxious Weed List [3] | Observation [4] |
|---|---|---|---|
| **Colorado State B List [1]** | | | |
| Russian knapweed<br>*Acroptilon (Centaurea) repens* | X | X | Location along Mesa County V.2 Road, access to Winter Flats; locations along Garfield CR 200, access to Homer Deep; location along access road in Horseshoe Canyon |
| Jointed goatgrass<br>*Aegilops cylindrical* | | X | Multiple locations on Mesa County V.2 Road, within Winter Flats; multiple locations along Garfield County roads 200 and 222 |
| Musk thistle<br>*Carduus nutans* | X | X | Along Garfield CR 222, within Homer Deep; multiple locations within Horseshoe Canyon |
| Diffuse knapweed<br>*Centaurea diffusa* | X | X | Along access road within Homer Deep and access roads in Horseshoe Canyon |
| Canada thistle<br>*Cirsium arvense* | X | X | Along Garfield CR 222, within Homer Deep |
| Russian olive<br>*Elaeagnus angustifolia* | | | Adjacent to Mesa County V 2 Road. Access to Wagon Track and stock ponds in Horseshoe Canyon |
| Tamarisk (Saltcedar)<br>*Tamarix ramosissima,*<br>*Tamarix parviflora* | X | X | Multiple locations along Mesa County V.2 Road, access to Winter Flats; multiple locations along Garfield CR 200, other access roads within Homer Deep; along roads and drainages in Horseshoe Canyon and Wagon Track |
| **Colorado State C List** | | | |
| Common burdock<br>*Arctium minus* | | X | Locations along Garfield CR 222, within Homer Deep |
| Downy brome (Cheatgrass)<br>*Bromus tectorum* | | | Ubiquitous |
| Chicory<br>*Cichorium intybus* | | X | Location along Garfield CR 200, within Homer Deep. Adjacent to Mesa County V 2 and S roads, access to Wagon Track |
| Field bindweed<br>*Convolvulus arvensis* | | | Extensive along Mesa County V.2 Road, within Winter Flats; locations along Garfield CR 200, access to Homer Deep |
| Redstem filaree<br>*Erodium cicutarium* | | | Location along Mesa County S Road, access to Wagon Track |
| Halogeton<br>*Halogeton glomeratus* | | | Multiple locations on Mesa County V.2 Road, access to Winter Flats and on Mesa County S Road access to Wagon Track and access roads in Horseshoe Canyon |
| Bulbous bluegrass<br>*Poa bulbosa* | | | Present on access roads in Homer Deep |
| Common mullein<br>*Verbascum Thapsus* | | | Multiple locations along Garfield CR 222 within Homer Deep |

Sources:
[1] Colorado Department of Agriculture, 2012.
[2] Mesa County, 2009.
[3] Garfield County, 2011.
[4] WestWater Engineering, 2012a, 2012b, 2012c and 2012d.

### 3.3.1.2 Environmental Consequences

**Proposed Action Alternative**

The Proposed Action could affect abundance of noxious weeds through one or more of the following pathways:

1. Clearing native vegetation and exposing bare ground surfaces to allow establishment and growth of weed species;

2. Translocating weeds from established infestations to newly cleared ground by personnel vehicles and construction equipment; and
3. Reducing vigor and reproduction of native plants through dust deposition, interference with photosynthesis and impact to pollinators of native plant species that allows weeds to infiltrate and increase in affected locations.

Surface disturbance, increased vehicle traffic, equipment placement and operation, foot traffic and other activities associated with the Proposed Action could increase the distributions of established weed species (see Table 3.3-1) and/or could introduce new invasive species into areas that are not currently infested. Clearing native vegetation and exposing bare ground surfaces, especially within closed canopy big sagebrush shrub communities, allows invasive species, particularly annuals, to become established at the expense of perennial bunchgrasses (West, 1988).

Surface disturbance that would be revegetated immediately after construction would be less likely to be infested by weeds than if left as exposed soil for longer periods. If revegetation efforts are not successful, the likelihood of weed infestation would be much higher and would require controlling and monitoring invasive non-native plants and noxious weeds as necessary components of reclamation (BLM and Forest Service, 2007). Black Hills would revegetate/reclaim disturbance resulting from pipeline installation and road construction at the time of installation, which would minimize the potential for the disturbed areas to be infested with invasive and noxious weeds.

As mandated by the Colorado Noxious Weed Act and the Colorado Oil and Gas Conservation Act and in conformance with the Weed Management and Invasive Species Program (also see BLM, 2007a), oil and gas operators shall control noxious weeds on lands they disturb during oil and gas exploration and development, including well pads, facilities, pipelines, roads and any other disturbed areas on BLM-administered lands and private property. Controlling listed weeds could be difficult to achieve on disturbed surfaces after construction of the Proposed Action.

**Protective/Mitigation Measures**

The following measures are included in Black Hills' proposal, to minimize impacts from invasive/non-native species:

- BLM's *Noxious and Invasive Weed Management Plan for Oil and Gas Operators* (BLM, 2007a) would be implemented, to reduce or eliminate noxious weeds identified on BLM-administered lands within the project area and prevent the spread of weeds into uninfested areas, including:
    - The project area would be inventoried prior to ground-disturbing activities. If Class A or Class B noxious weeds are documented within 100 feet of proposed disturbance, they would be treated or removed prior to ground-disturbing activities (Class B and Class C weeds were documented within 100 feet of the proposed project on BLM-administered lands; see WestWater Engineering, 2012a, 2012b, 2012c and 2012d).
    - All equipment used at previous construction sites, or within sites with weed seed contaminated soil would be power-washed to remove mud, weed seeds and propagules before entering the construction area and/or moving to uncontaminated terrain. All maintenance vehicles would be regularly cleaned of soil.
- Treatment strategies for weedy species documented would consider effective methods and timing for preventing seed production of that species and could include

hand/machine pulling, cutting roots just below soil level, treatment with herbicides, or mowing, as directed by the BLM.

- Surface disturbances would be reseeded at the appropriate time and with a palatable, native species desirable to wildlife including shrubs, grasses and forbs seed mixture (see Table 2.2-8).
- Black Hills would provide an annual report to the BLM that identifies the extent of noxious weed infestations and any treatment used to eradicate or minimize undesirable plant species. The report would be provided by December 1, annually, until the desired reclamation level is achieved.
- Prior to the use of herbicides, a PUP would be approved by the BLM.

The following BLM GJFO Standard COAs would be required, to minimize impacts from invasive, non-native species:

- Before any mobilization of equipment onto public lands, to prevent the spread of invasive species, the operator will perform inspections to insure that all construction equipment and vehicles are clean and free of soil, mud and vegetative material. Avoid driving through or parking on weed infestations.

In addition to the measures described above, the BLM would require the following, to further reduce effects from invasive, non-native species:

- Weed treatments should be limited to spot treatments within areas with sensitive plant species subject to site-specific pre-approval by the BLM.

**No Action Alternative**

Under the No Action Alternative, none of the direct and indirect effects resulting from invasive non-native species that are discussed above would occur. State-listed noxious weeds and other non-native, non-listed species would continue to affect native, unaltered vegetation as well as existing disturbed vegetation and habitat in the project area.

### 3.3.2 Vegetation (Includes a Finding on Standard 3)

#### 3.3.2.1 Current Conditions

Existing vegetation for the project area was classified using Colorado Gap Analysis Project (Colorado GAP; Schrupp et al., 2000). The majority of vegetation cover types within the project area was digitized from aerial photography and classified based on the predominant vegetation physiognomy (e.g., trees, shrubs, herbaceous vegetation) and dominant species present. GIS data coverages of vegetation from the BLM GJFO and Colorado GAP were also used, generally within the Horseshoe Canyon area and project-connecting access roads, to classify vegetation within the project area. The vegetation classifications were field-checked during on-site reconnaissance in June 2009 and during survey efforts in 2010 through 2012 (WestWater Engineering, 2010, 2011a, 2011b, 2011c, 2012a, 2012b, 2012c and 2012d).

Vegetation in the project area can be defined as one of six major types: 1) Forest and Woodland, 2) Shrubland, 3) Graminoid and Forb, 4) Developed Land (a combined grouping of agriculture, industrial, urban and mine lands), 5) Exposed Rock and 6) Open Water (Schrupp et al., 2000). Each major type is further subdivided by dominant vegetation species present. Overall, density and composition of vegetation are driven by aspect, substrate and resulting available moisture. Vegetation on south-facing slopes is generally sparser due to xeric conditions while vegetation on north-facing slopes can be considerably denser, characteristic of more mesic conditions.

Pinyon-Juniper Woodland is the most extensive vegetation community in the project area, especially in the Homer Deep and Winter Flats areas. Pinyon-juniper woodland communities are mosaics of pinyon pine-Utah juniper woodlands and sagebrush-dominated shrublands. In cooler and mesic areas, Utah juniper is replaced by Rocky Mountain juniper (Lyon et al., 1996 and 2001). Shrubs commonly associated with pinyon-juniper woodlands include mountain mahogany, Utah serviceberry, Gambel oak and snowberry (WestWater Engineering, 2012a, 2012b, 2012c, 2012d; Lyon et al., 1996 and 2001). Ponderosa pine woodland occurs within incised canyons, especially Pine Gulch in western Winter Flats.

Shrublands in the project area are dominated by sagebrush communities and are often located on deep, well-drained sandy soils adjacent to steeper slopes covered with pinyon-juniper woodlands. Big Sagebrush Shrubland is common throughout the project area and is more prevalent in the Horseshoe Canyon and Wagon Track areas than elsewhere. The sagebrush dominated shrublands are composed of big sagebrush, Douglas rabbitbrush, plains prickly pear, black greasewood, shadscale and 4-wing saltbush, forbs and various grasses. Extensive stands of big sagebrush shrublands are found in the valley floor in the Dry Fork. Non-native cheatgrass dominates portions of the shrubland understory (WestWater Engineering, 2012a, 2012b).

Gambel oak is associated with a variety of shrubs including serviceberry, myrtle pachistima, common chokecherry and mountain snowberry (Lyon et al., 1996). Two portions of the Wagon Track area burned during the Pine Ridge fire in early July 2012. An area of 404 acres burned in the southern half, another 105 acres burned across the middle of Wagon Track. Burned areas were on the south and north sides of Sulphur Gulch. Overall, the fire burned 13,920 acres, mostly pinyon-juniper woodlands and big sagebrush (Fresques and Holsinger, 2012).

Developed vegetation includes above-ground structures, roads, industrial sites, bare ground areas, private land development, irrigated hay fields and pastureland. There are several residences and dryland and irrigated agricultural fields present in the northern portion of the project area (Homer Deep) and in the Horseshoe Canyon area. Major crops are grass hay and alfalfa (Lyon et al., 2001).

Riparian forest and riparian shrub vegetation are limited in the project area and are associated with drainages, seeps, springs and impoundment ponds that are primarily dominated by cottonwoods, boxelder and willows. Shrub-dominated riparian zones have been invaded by exotic species, including saltcedar or tamarisk, Russian olive, Canada thistle and Russian knapweed.

**Public Land Health Standard 3**

Standard 3 - Healthy, productive plant and animal communities of native and other desirable species are maintained at viable population levels commensurate with the species and habitat's potential. Plants and animals at both the community and population level are productive, resilient, diverse, vigorous and able to reproduce and sustain natural fluctuations and ecological processes.

Land Health Assessments for the DeBeque/Roan Creek landscape area were completed in 2004 and 2006 (BLM, 2009a). Approximately 17 percent of the assessed area was not meeting Standard 3 due to multiple factors, including (BLM, 2009a):

- Invasive species (cheatgrass), with very few perennials,
- Past grazing, drought, some present grazing and
- Surface disturbances related to oil and gas activity, specifically, poorly revegetated pipelines.

All or portions of the Homer Deep, Winter Flats and Wagon Track areas of the Proposed Action failed to meet Land Health Standard 3 in 2009 (BLM, 2009a).

The BLM recently conducted a Land Health Assessment within the Big Park grazing allotment which coincides with the Horseshoe Canyon area. Approximately 15 percent of BLM-administered lands were found not to be meeting (Standard 3) or were found to be "meeting, with problems," due to low or reduced diversity of perennial species, to the high presence of cheatgrass, to reduced cryptobiotic soil crust/species and to a late-seral stage community of big sagebrush, with juniper developing in some locations. A fire removed sagebrush at some point, which has been replaced by greasewood cheatgrass and weedy non-native species. Black Hills' ground disturbance could further contribute to the proliferation of invasive annual species, especially cheatgrass.

#### 3.3.2.2 Environmental Consequences

**Proposed Action Alternative**

The Proposed Action could affect vegetation through one or more of the following pathways:

1. Direct removal of vegetation during clearing and grading well pads, centralized facilities, pipelines and roads.
2. Damage or mortality of plants by dust deposited on photosynthetic surfaces during construction and operation.
3. Changes in herbivory by domestic and/or native herbivores caused by displacement from affected areas or attraction to newly re-vegetated sites.
4. Introduction or an increase in noxious weeds could alter vegetation cover and species composition, potentially out-competing native plant species.

Construction of the Proposed Action would directly affect vegetation by removal. Direct effects to herbaceous vegetation would be expected to be short-term (assuming vegetation becomes re-established within 5 years of disturbance), whereas effects to shrub-dominated and forest-dominated vegetation would persist for more than 5 years. For example, sagebrush can take up 10 to 15 years to become reestablished (West, 1988). Mature pinyon-juniper woodlands may be more than 140 years old, originating in pre-settlement times (Miller et al., 2008) and would not become reestablished in the life of the project if removed. Effects to deciduous oak woodlands and possibly other shrub-dominated vegetation would persist for more than 5 years. Black Hills would use brush-hogging techniques for clearing in big sagebrush shrublands, where appropriate, to leave root structure intact and to preserve seed stock and promote faster sagebrush revegetation (see Biological Resources Protection Plan, Appendix E).

Damage or mortality to individual plants as a result of decreased light transmission due to dust deposited directly on leaves or other photosynthetic surfaces could occur due to increased traffic along existing roads during construction and operation. Dust from construction and related traffic could impair photosynthesis, gas exchange, transpiration, leaf morphology and stomata function (Farmer, 1993; Sharifi et al., 1997; Rai et al., 2009). Dust from construction and related traffic could also interfere with plant reproduction by affecting pollinators during the flowering sea son. Black Hills would control fugitive dust on the access roads and within disturbed surfaces during construction to minimize effects to adjacent vegetation. Speed limits would be enforced from the beginning of construction throughout the life of the project and where speed limits are not posted on unpaved access roads, speeds would not exceed 20 miles per hour (see Biological Resources Protection Plan, Appendix E).

Indirect effects to vegetation might occur if the Proposed Action displaced native and domestic herbivores, causing excessive browsing and/or grazing on vegetation resources that otherwise would not occur. Alternatively, herbivores could be attracted to unaffected vegetation adjacent

to newly revegetated locations, causing excessive browsing and/or grazing following restoration. To eliminate negative effect on restored surfaces from grazing, Black Hills would exclude cattle from revegetated areas to support complete revegetation of the disturbed area (see Biological Resources Protection Plan, Appendix E).

Indirect effects to native vegetation could occur if invasive, non-native species became established in cleared, disturbed areas and resulted in infestations that might limit or prohibit growth of native and/or desirable species. Weed seeds or cuttings of some species could be transported naturally (wind and water) or accidentally (vehicles or other equipment) to the disturbed areas. Weed seeds may be present in the native soil materials and the removal of vegetative cover and soil disturbance might promote weed establishment at the expense of desirable species. Black Hills would revegetate and reclaim all pipeline-related disturbed surfaces at the time of installation, which would minimize disturbed substrate availability for noxious weed establishment. Additionally, interim reclamation would occur within 1 year of the last well drilled on the pad (see Biological Resources Protection Plan).

The Proposed Action has been analyzed for clearing 282.28 acres of upland vegetation; however, actual disturbance is estimated at 268 acres with well pads not to exceed 6.8 acres each (see Table 3.3-2). The majority of effects would be to big sagebrush shrubland and pinyon-juniper woodland. Additional effects to wetland/riparian vegetation are included in Section 3.3.3.1.

**Table 3.3-2**
**Areas (acres) of Upland Vegetation Types Affected by the Proposed Action**

| | Area (acres) Affected by Construction by Area | | | | |
|---|---|---|---|---|---|
| **Vegetation Type** | **Homer Deep** | **Winter Flats** | **Wagon Track** | **Horseshoe Canyon** | **Project Area Total** |
| **Forested/Woodland** | | | | | |
| Pinyon-juniper woodland type | 38.02 | | | 25.88 | 63.90 |
| | | | | | |
| **Shrubland** | | | | | |
| Big sagebrush shrubland type | 56.24 | 9.24 | 17.34 * | 72.71 | 155.53 |
| Deciduous oak type | 0.21 | | | | 0.21 |
| Greasewood fans and flats type | 10.10 | | | 5.11 | 15.21 |
| Saltbush fans and flats type | 2.10 | | | 10.69 | 12.79 |
| Disturbed Shrubland | 6.86 | 0.91 | 3.28 * | 11.55 | 22.60 |
| Shrub and Brush Rangeland | | | | 0.02 | 0.02 |
| | | | | | |
| **Grassland** | | | | | |
| Foothill and mountain grasslands | | | | | |
| **Developed Land** | | | | | |
| Irrigated crop type | 0.23 | | | 6.24 | 6.47 |
| Disturbed Ground | 2.01 | | | | 2.01 |
| Road | 3.11 | | | | 3.11 |
| **Bare Ground** | | | | | |
| Exposed rock type | 0.15 | | | 0.28 | 0.43 |
| | | | | | |
| | | | | | |
| **Total** | **119.03** | **10.15** | **20.62** | **132.48** | **282.28[1]** |

* Portions burned during 2012 Pine Ridge fire.
[1] Actual short-term disturbance under the Proposed Action is estimated to be 268 acres with well pads not to exceed 6.8 acres each.

### Protective/Mitigation Measures

The following measures are included as design features in Black Hills' proposal to minimize impacts to vegetation:

- Brush-hogging techniques would be used for clearing in big sagebrush shrublands, where appropriate, to leave root structures intact, to preserve seed stock and promote faster sagebrush revegetation.
- Fugitive dust would be controlled on the access roads and disturbed surfaces, to minimize effects to adjacent vegetation. Speed limits would be enforced from the beginning of construction throughout the life of the project, and where speed limits are not posted on unpaved access roads, speeds would not exceed 20 miles per hour.

The following BLM GJFO Standard COAs would be required, to minimize impacts to vegetation:

- Pre-construction BMPs will be installed before construction. Areas of approved activities will be cleared of brush and trees, usually chipped or shredded in place, then salvaged and stored with topsoil. No stump left in place will exceed six inches in height. Cleared trees and shrubs that are not shredded may be salvaged and stored as storm water perimeter controls for later redistribution on reclaimed areas, as appropriate (see Section 3.5.8 (Fire and Fuels) for related protective/mitigation measures).
- Within 30 days of completion of pad construction, topsoil storage piles, storm water control features, temporarily disturbed areas along roads and pipelines, and cut and fill slopes will undergo temporary seeding to stabilize the materials, maintain biotic soil activities, and minimize weed infestations. Seedbed preparation may not be required for topsoil storage piles or other areas of temporary seeding, but track-walking is typical.

In addition to the protective measures described above, the BLM would require the following measures to further mitigate impacts to vegetation affected by the Proposed Action:

- Berms of topsoil should be placed around well pad perimeters to keep appropriate seed banks segregated and leave them to be replaced in the spatial context from which they were removed during pad construction.
- Exclusion fencing should be erected along the revegetated pipeline and road disturbance in highly vulnerable areas (i.e., along stream banks) to exclude livestock, accelerate reclamation of surface disturbances and minimize weed infestations, until monitoring determines that reclamation is successful. The BLM would determine areas for potential exclusion.
- Within areas used for livestock grazing, salt licks and water tanks, where animals congregate, should be placed away from the revegetated disturbance, to reduce livestock use of reclaimed areas and increase the likelihood for successful reclamation.

**No Action Alternative**

Under the No Action Alternative, there would be none of the direct and indirect effects to vegetation that are expected by implementing the Proposed Action, discussed above. Vegetation present in the project area (see Table 3.3-2) would persist into the foreseeable future. However, it is likely that native, unaltered vegetation and existing disturbed shrub vegetation would continue to be affected by infestations of non-native annual species, especially cheatgrass, in the foreseeable future. Noxious weeds would continue to affect native vegetation cover, vegetation composition and species diversity and plant vigor.

The No Action Alternative would eliminate proposed treatments of noxious weeds as described in Chapter 2.

**Finding on the Public Land Health Standard 3 (Vegetation)**

New surface disturbances caused by the Proposed Action could result in new areas for invasion by noxious weeds, including cheatgrass. With strict adherence to the protective measures described above, the Proposed Action might not further degrade plant communities in the assessment area.

Implementation of measures to eliminate or reduce the spread or introduction of noxious weeds, as outlined in the BLM's Noxious and Invasive Weed Management Plan for Oil and Gas Operators (see BLM, 2007a) would help prevent more degradation of plant communities.

Under the No Action Alternative, effects from existing and new surface disturbances (unrelated to the Proposed Action) would continue and could affect Public Land Health Standard 3.

### 3.3.3 Wetlands and Riparian Zones (Includes a Finding on Standard 2)

#### 3.3.3.1 Current Conditions

Wetlands are subject to protection under federal law and Executive Order 11990, regardless of land ownership. The EPA and the USACE use the following definition of wetland to administer the Clean Water Act's Section 404 permit program for dredge and fill activities: those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas (40 CFR §230.3 and 33 CFR §328.3).

WestWater Engineering performed a wetland evaluation of the project area from 2009 through 2012 (WestWater Engineering, 2009a, 2009b, 2010, 2011a, 2011b, 2011c and 2012 a - d). Potentially jurisdictional wetlands were identified on the basis of the vegetation, soils and hydrologic characteristics present at the site in accordance with the 1987 USACE Wetlands Delineation Manual and the Arid West Regional Supplement to USACE Wetland Delineation Manual, April 2008. No survey access was permitted along 2.94 miles of proposed gathering pipelines in the Homer Deep (1.95 miles) and Horseshoe Canyon (0.99 mile) areas, as well as 1.86 miles along the proposed temporary surface water pipeline. No wetland delineations were performed. WestWater Engineering (2009a, 2009b, 2010, 2011a, 2011b, 2011c and 2012 a – d) identified potential wetlands in the project area.

Riparian areas occur as narrow zones adjacent to drainages and wetland areas. Perennial systems that support riparian zones located within the project area include North Fork Dry Creek and Roan Creek (see Table 3.2-27). Other creeks and drainages that occur in the project area include South Dry Fork which is an intermittent system, and numerous ephemeral drainages. Portions of the riparian zones along the Dry Fork and Roan Creek within the project area have been degraded by invasive species, road encroachment, agricultural use, historic grazing and proximity of utilities and other facilities. The potential extent of the riparian zone has been restricted in many locations due to the proximity of Garfield CR 204 (a continuation of Roan Creek Road) and Garfield CR 222.

Shrub-dominated riparian zones have been invaded by exotic species, including saltcedar or tamarisk, Russian olive, Canada thistle and Russian knapweed (Doyle et al., 2002; Rocchio et al., 2001). Native vegetation that occurs along riparian zones consists of greasewood, rabbitbrush and big sagebrush, facultative upland species having little association with riparian zones. The presence of these species in close proximity to riparian zones is often an indicator of decreasing water tables and/or increased compaction and declining riparian health. Facultative wetland/riparian tree and shrub species present include box elder, willows and cottonwoods. Herbaceous vegetation includes alkali sacaton, cattails, common spikerush, foxtail barley, saltgrass and scratchgrass. Seeps, springs and impoundment ponds also occur within the project area and often support similar plant species found along drainages. Submergent

vegetation such as pondweed, duckweed, ditchgrass and watercress, as well as sedges, rushes and grasses are also present (Doyle et al., 2002; Rocchio et al., 2001). Many of the creeks, seeps, springs and ponds have been altered and/or modified from their natural condition due to livestock grazing, diversions and impoundments (Doyle et al., 2002; Rocchio et al., 2001). Scientific names of plant species discussed in the text for this section are provided in Appendix I.

The BLM conducted Proper Functioning Condition (PFC) assessments for portions of stream reaches on public lands within the DeBeque/Roan Creek landscape, including Dry Fork and Roan Creek. The assessment noted the presence and condition of riparian systems in the landscape, which includes the Homer Deep, Wagon Track and Winter Flats project area components. Properly functioning riparian systems have the ability to recover from major disturbances such as those associated with fire, grazing and flooding. The majority of the Dry Fork reaches were rated as PFC in 2004. A PFC assessment was also conducted on South Dry Fork, within Homer Deep Unit, in 2004. This segment was also rated as PFC indicating soil moisture sufficient to support a diverse and healthy riparian community. The Colorado River was assessed in 2005 and was found to meet PFC (BLM, 2009a).

**Public Land Health Standard 2 (Riparian Habitat)**

Standard 2 - Riparian systems associated with both running and standing water function properly and have the ability to recover from major disturbance such as fire, severe grazing, or 100-year floods. Riparian vegetation captures sediment and provides forage, habitat and bio-diversity. Water quality is improved or maintained. Stable soils store and release water slowly. Land Health Assessments for the DeBeque/Roan Creek landscape area indicate presence of 3 lotic riparian systems (BLM, 2009a).

A Land Health Assessment recently conducted in the Big Park grazing allotment that coincides with the Horseshoe Canyon area concluded that in general, Land Health Standard 2 is being met. Areas that have been identified with problems are at risk due to reduced perennial plant cover and reduction of cryptobiotic soil crust, with associated poor soil infiltration.

### 3.3.3.2 Environmental Consequences

**Proposed Action Alternative**

The Proposed Action has been analyzed for clearing 2.38 acres of wetland/riparian vegetation and open water. The majority of effects would be to shrub dominated wetland/riparian vegetation in the Horseshoe Canyon area (Table 3.3-3). Effects to forest-dominated riparian vegetation would persist for more than 5 years.

**Table 3.3-3**
**Areas (acres) of Wetland/Riparian Vegetation Types Affected by the Proposed Action**

| | Area (acres) Affected by Construction by Area | | | | |
|---|---|---|---|---|---|
| **Vegetation Type** | **Homer Deep** | **Winter Flats** | **Wagon Track** | **Horseshoe Canyon** | **Project Area Total** |
| **Forested/Woodland** | | | | | |
| Forest dominated wetland/riparian | | | | 0.33 | 0.33 |
| **Shrubland** | | | | | |
| Shrub dominated wetland/riparian | 0.45 | | | 0.92 | 1.37 |
| **Open Water** | | | | | |
| Water bodies | 0.19 | 0.05 | | 0.44 | 0.68 |
| **Total** | **0.64** | **0.05** | **0** | **1.69** | **2.38** |

Table 3.3-4 summarizes the potential wetlands located within 100 feet of proposed disturbance including that for well pads, centralized facilities, pipelines, road improvements, new road construction and the temporary surface water pipeline (no disturbance).

**Table 3.3-4**
**Potential Wetlands Documented during**
**Wetland Evaluations (2009 – 2012) within 100 feet of the Proposed Disturbance**

| Project Component | Wetland Description | Proximity to Proposed Action |
|---|---|---|
| ***Homer Deep Area*** | | |
| Proposed Gathering Line | One fringe wetland (2012) along ditch approximately 6 - 12 inches wide; sedges present. | Adjacent to proposed pipeline corridor. |
| Proposed Gathering Line | One fringe wetland (2012) along ditch approximately 12 inches wide; sedges present. | Proposed pipeline crosses ditch. |
| Proposed Gathering Line | One deep fringe wetland (2012) approximately 12 to 18 inches each side of Dry Fork with coyote willow, reed canary grass, common reed and rushes present. | Proposed pipeline crosses unnamed tributary to Dry Fork. |
| Proposed Gathering Line | One possible wetland on each side of Dry Fork (2012). | On edge of proposed pipeline corridor. |
| Proposed Gathering Line/ Existing Access Road | One pond (2009). | Approximately 30 feet downgrade of existing road to HDU 24-11; opposite side of proposed pipeline disturbance. |
| ***Horseshoe Canyon Area*** | | |
| Proposed Gathering Line/ Existing Access Road | Old stock pond (2012) with cattails and two young cottonwoods. | Edge of road to HSC CF#1; opposite side of existing road as proposed pipeline corridor. |
| Proposed Gathering Line/ Existing Access Road | Pond (2012) with cattails. | Edge of pipeline corridor to HSC CF#1. |
| ***Temporary Surface Water Line*** | | |
| Mesa County V.2 Road | One wetland (2012) at mouth of wash, approximately 4 meters wide; cockleburrs present. | Edge of Mesa County V.2 Road on opposite side of the proposed surface pipeline. |

Construction in wetlands and riparian zones could potentially degrade water quality, affect hydrology and affect wildlife. Eight wetlands were identified within 100 feet of either proposed gathering pipelines or the temporary surface water delivery pipeline (see Table 3.3-4); no wetlands were found within 100 feet of proposed well pad locations or centralized facilities. No direct disturbance would be expected at three of the wetlands documented during survey efforts (one pond in the Homer Deep Unit, one stock pond in the Horseshoe Canyon Unit and one wetland along the temporary surface pipeline route), because proposed disturbance would be on the opposite side of the existing roads. Impacts to riparian vegetation that depends upon higher water tables includes direct removal or trampling of vegetation, loss of root mass stabilizing banks, compaction of soils in work areas and introduction or spread of noxious and invasive weeds or undesirable increasers that may be present in the area that may displace native riparian species.

Site-specific BMPs would be required to be implemented/monitored/maintained to try and minimize effects to wetlands during construction. WestWater Engineering did not conduct wetland delineations, only wetland evaluations. Wetlands associated with a pond identified adjacent to the proposed gathering pipeline corridor to HSC CF#1 in the Horseshoe Canyon Unit could be affected during construction by altering hydrology in the intermittent drainages, but moving the pipeline to the opposite side of the road or reducing the width of the pipeline construction corridor might avoid or minimize effects. Construction of the proposed gathering pipelines within the Homer Deep area could also affect fringe wetlands associated with at least three drainages that would be crossed (unnamed tributaries to Dry Fork).Implementation of SWMPs and BMPs would reduce the effects of construction in drainages. Avoidance of wetlands is preferable, but wetland delineations in compliance with USACE regulations should be performed if construction in wetlands would occur.

Minimizing the corridor width at two of those crossings could avoid or reduce effects to wetlands. Use of wooden or other protective mats during construction across or near the drainages, per the BLM GJFO Standard COAs, could minimize effects to fringe wetlands. Implementation of BMPs and other construction techniques identified in site-specific SWMPs could also reduce the effects of construction in wetlands. Effects to riparian zones along the pipeline routes could be minimized by reducing the corridor width at drainage crossings. The proposed pipeline would cross Dry Fork in numerous locations. A water diversion that would dewater the creek is also proposed in Section 10. The water diversion could lead to decreased width of the riparian habitat as well as the vigor, health, or even persistence of riparian characteristics.

**Protective/Mitigation Measures**

The following BLM GJFO Standard COAs would be required, to minimize impacts to wetlands:

- The operator will obtain appropriate permits from the U.S. Army Corps of Engineers (USACE) prior to discharging fill material into waters of the U.S. in accordance with Section 404 of the Clean Water Act. Waters of the U.S. are defined in 33 CFR Section 328.3 and may include wetlands as well as perennial, intermittent, and ephemeral streams. Permanent impacts to waters of the U.S. may require mitigation. Copies of any printed or emailed approved USACE permits or verification letters will be forwarded to the BLM.
- When activity in a wetland is unavoidable, the operator may be required to prevent disturbance by use of wooden or other protective mats and will restore all temporarily disturbed wetlands or riparian areas. The operator will consult with the BLM to determine appropriate mitigation, including verification of native plant species to be used in restoration. Temporary and permanent impacts to jurisdictional waters of the U.S. may

require additional mitigation, including compensatory offsite mitigation. Contact the USACE, Colorado West Regulatory Branch, at 970-243-1199.

In addition to the measures described above, the BLM would require the following measures to further reduce potential effects to wetlands and riparian zones:

- The proposed gathering pipelines in the Horseshoe Canyon Unit that are adjacent to the existing pond should be moved to avoid effects to associated wetlands. Or pipeline disturbance width should be reduced to 30 feet from the edge of the existing road to avoid or minimize effects to wetlands associated with the pond. Prior BLM approval shall be required.
- To avoid direct effects to two wetlands adjacent to the proposed gathering pipelines in the Homer Deep Unit, the pipeline corridor width should be reduced. At the time of APD submission, the SUPO should include this reduction of pipeline disturbance.
- In areas that have not been previously surveyed, a monitor should be on site during pipeline routing to identify potential wetlands and avoid, if feasible.
- A wetland delineation should be conducted for the wetlands identified in Table 3.3-4 that cannot be avoided; and appropriate permits from the USACE should be obtained.
- Riparian canopy or stream bank vegetation should not be removed, where possible.
- Woody debris should be retained as much as possible during in-stream construction.
- To minimize effects to vegetation in riparian zones adjacent to creeks and drainages crossed by or near the proposed gathering pipelines (see Table 3.3-4), the proposed disturbance width should be reduced and the following measures should be implemented and included in the APD at the time it is submitted:
    - The construction corridor and ROW width at perennial and intermittent stream crossings (see table 3.2-27) should be reduced to 30 feet to reduce impacts to riparian zones along these systems.
    - Pre-construction inspections should include on-the-ground review of installed pre-construction Storm Water BMPs and limit-of-disturbance staking, especially where pipeline construction could affect drainages or riparian systems.
    - Equipment bridges and mats should be used where soils are saturated, to minimize compaction of soils and subsequent stream bank erosion.
    - Grading should be minimized to the pipeline trench areas. Woody vegetation (shrubs and trees) should be shredded or cut at ground level to facilitate riparian reestablishment from existing root systems. Such measures to facilitate rapid and successful reclamation would also minimize sedimentation.
    - Topsoil should be salvaged and segregated and redistributed as part of seedbed preparation.
    - Site-specific riparian appropriate species plantings, BMPs and restoration techniques should be implemented as needed.
    - Riparian tree saplings such as cottonwoods and box elders with a diameter at breast height of 1 inch or greater should not be removed.
    - Construction of stream crossings should take place during low flow to reduce potential impacts to the riparian zone.

**No Action Alternative**

Under this alternative, the project would not be constructed and no crossings of either WoUS or wetlands would occur by the Proposed Action. Therefore, no effects to wetlands and riparian zones would occur.

**Finding on the Public Land Health Standard 2 (Riparian Habitat)**

With implementation of identified protective and minimization measures, construction and operation of the Proposed Action could be expected to minimally affect Public Land Health Standard 2.

Under the No Action Alternative, effects from existing and new surface disturbances (unrelated to the Proposed Action) would continue and could affect Public Land Health Standard 2.

### 3.3.4 Threatened, Endangered, Candidate and Sensitive Animal Species

#### 3.3.4.1 Current Conditions

**Threatened, Endangered and Candidate Species**

Threatened and Endangered Species include those species listed by the FWS under the ESA (ESA-Listed Species) and those listed by the State of Colorado. The FWS Candidate species are also discussed below under ESA-Listed Species. Sensitive Species include those species identified by the BLM as being sensitive within the GJFO area, as well as those listed by the State of Colorado as threatened or endangered or species of concern, but not listed under the ESA.

**ESA-Listed and Candidate Species.** FWS (2012a) identified seven vertebrate species listed under the ESA that potentially occur in Mesa and Garfield counties. Three additional species are candidates and included in Table 3.3-5. Recently, the FWS (2013) proposed listing wolverine as threatened which also potentially occurs in the two counties.

Canada Lynx. Federally threatened (FWS, 2000) Canada lynx are likely to occur within the GJFO Resource Management Plan Planning Area (RMPPA) as they expand their range within Colorado, and they have been documented on National Forest System lands adjacent to the RMPPA (BLM, 2009a). Between 1999 and 2007, the Colorado Division of Wildlife - CDOW (now Colorado Parks and Wildlife - CPW) reintroduced 218 Canada lynx to the San Juan Mountains in southwestern Colorado (Shenk, 2005). Typically, Canada lynx are associated with boreal forests of Canada and Alaska. Lynx also are found in the northern contiguous United States bordering Canada and in isolated and/or dispersing populations in states that are farther south, including Utah, Wyoming and Colorado (FWS, 2003a). There are no records of lynx and no suitable denning or foraging habitat is present in the project area.

Wolverine. The FWS (2013) proposed listing the North American wolverine as threatened under the ESA. The distribution of records documenting wolverines in Colorado was compiled by Nead et al. (1985). Four reports were in eastern Rio Blanco County and seven reports of wolverine were in Garfield County. Although a viable population of wolverines in Colorado could not be verified, the potential for some animals to occur in certain areas of the state was proposed, including in the southwestern portion of the Flat Tops Wilderness area in Garfield County (Nead et al., 1985). FWS (2013) concluded that wolverine populations currently exist in the Rocky Mountains, although there is no evidence of an extant population in Colorado. In 2009, a male wolverine emigrated 500 miles from Grand Teton National Park to northern Colorado (Harmon, 2009), indicative of their ability for long-distance movements but not of possible population re-establishment (FWS, 2013). The North American wolverine would not be affected by the Proposed Action and the species is not considered further.

**Table 3.3-5**
**ESA-Listed Endangered, Threatened, Proposed and Candidate Animal Species that are Known or Have Potential to Occur within the Project Area**

| Species Common Name<br>Scientific Name | Status [1] | | Species and Critical Habitat (CH) Listed in County | |
|---|---|---|---|---|
| | ESA | State [2] | Mesa, CO [3] | Garfield, CO [3] |
| **Mammals** | | | | |
| Canada lynx<br>*Lynx Canadensis* | FT | SE | Yes | Yes |
| Wolverine [4]<br>*Gulo gulo* | FPT | SE | Yes | Yes |
| **Birds** | | | | |
| Mexican spotted owl<br>*Strix occidentalis lucida* | FT | ST | | Yes |
| Yellow-billed cuckoo<br>*Coccyzus americanus* | FC | SC | Yes | Yes |
| Gunnison's sage-grouse<br>*Centrocercus minimus* | FC | SC | Yes | |
| Greater sage-grouse<br>*Centrocercus urophasianus* | FC | SC | | Yes |
| **Fish** | | | | |
| Greenback cutthroat trout<br>*Oncorhynchus clarki stomias* | FT | ST | Yes | Yes |
| Colorado pikeminnow<br>*Ptychocelius Lucius* | FE | ST | Yes<br>CH | Yes<br>CH |
| Humpback chub<br>*Gila cypha* | FE | ST | Yes<br>CH | Yes |
| Bonytail<br>*Gila elegans* | FE | SE | Yes<br>CH | Yes |
| Razorback sucker<br>*Xyrauchen texanus* | FE | SE | Yes<br>CH | Yes<br>CH |

[1] ESA Status: FE = Federal Endangered, FT = Federal Threatened, FPT = Federal Proposed Threatened, FC = Federal Candidate. Colorado State Status: SE = State Endangered Species, ST = State Threatened Species, SC = State Candidate Species, None = No Status in Colorado.
[2] CPW, 2011a.
[3] FWS, 2012a.
[4] FWS, 2013.

Mexican Spotted Owl. The FWS listed the Mexican spotted owl as a threatened species in 1993 (FWS, 1993). At the time they were listed, there were only 20 historic records (13 records accepted) of spotted owls in Colorado, mostly from the San Juan Mountains in southwestern Colorado. Mexican spotted owls occur in old-growth or mature conifer forests that possess complex structural components and are near some type of water source. Spotted owls can also be found in canyon habitat dominated by vertical-walled rocky cliffs within complex watersheds that have small isolated patches or stringers of forested vegetation for roosting and foraging (FWS, 2011a). There are no records of Mexican spotted owl in the project area.

Greenback Cutthroat Trout. Biologists have recognized two distinct lineages of cutthroat trout within the range of Colorado River and Greenback cutthroat trout. These lineages have been tentatively called lineageCR (for Colorado River cutthroat trout) and lineageGB (for Greenback cutthroat trout). To date, 37 populations of lineageGB fish have been identified west of the Continental Divide (Metcalf et al., 2012).

Within the GJFO planning area, three streams are currently identified as being lineageGB, these streams are Carr Creek, Roan Creek and Coon Creek. Although outside of what is considered their "native range", these lineageGB populations are considered greenback cutthroat for the purposes of ESA compliance. Recent discoveries indicate that the only population of true greenback cutthroat trout survives today in Bear Creek, a small tributary of the Arkansas River

west of Colorado Springs. The research concluded that the greenbacks were likely stocked in Bear Creek in the early 1880s. The research confirms that all other presumed greenback cutthroat trout are actually descendants of West Slope fish that were stocked across the Front Range in the late 19th and early 20th centuries. Genetic analysis also revealed there are two distinct lineages of cutthroat in the Colorado River basin, not one. The first appears to have a native range centered on the White and Yampa rivers. The second is the fish formerly thought to be the greenback. Its native range appears to be centered on the Gunnison Basin, and may have extended into the Upper Colorado and Dolores drainages (Metcalf et al., 2012). The FWS has not updated their policy, therefore the fish in Roan Creek are still considered the threatened (FWS, 1978) greenback cutthroat trout (FWS, 2012b).

Colorado River Fish. Four species of Colorado River Basin fish, the bonytail, Colorado pikeminnow, humpback chub and razorback sucker, are listed as endangered (FWS, 1970, 1980 and 1991) and critical habitat (FWS, 1994) has been designated for all four species in the Colorado River and 100-year floodplain within Mesa County and for Colorado pikeminnow and razorback sucker in the Colorado River and 100-year floodplain in Garfield County.

The Colorado River mainstem within the Grand Valley is occupied by Colorado pikeminnows and razorback suckers from Palisade, downstream to Lake Powell (FWS, 2002a and 2002b). Although Colorado pikeminnow adults, spawning, dispersing larvae, juveniles and subadults have been documented in the 15-mile reach between Palisade and the Gunnison River, there has been no documented use of the Colorado River above Palisade in DeBeque Canyon or farther upstream (Osmundson, 2001; Valdez et al., 2011).

Historical records indicate that the river reach between DeBeque and Rifle has provided important habitat to razorback suckers (Osmundson, 2001). Razorback suckers were found spawning in areas without flow, off the main channel upstream from DeBeque and in riverside ponds 1 mile downstream from DeBeque during the early 1990's (Osmundson, 2001). Larval razorback suckers have been collected in the Colorado River downstream from the Price Stubb Diversion Dam (River Mile 185.1) between 2004 and 2007 (Table 7 in Osmundson and Seal, 2009). Fish passageways were completed at the Grand Valley Irrigation Company Diversion in 1997, at the Price-Stubb Diversion Dam 2008 and for the Grand Valley Project Diversion in 2005 (Valdez et al., 2011). The fish passageways would allow Colorado pikeminnows and razorback suckers to access about 50 miles of critical habitat from Palisade, upstream to Rifle (BOR, 2003).

The FWS (1994) designated critical habitat for the Colorado pikeminnow and razorback sucker in the Colorado River and its 100-year floodplain from Colorado River Bridge at exit 90 north of Interstate-70 near Riffle in Garfield County, to Westwater Canyon in Utah. Three primary constituent elements (PCEs) of the critical habitat include water, physical habitat and the biological environment (FWS, 1994). The water PCE includes quantity of water with sufficient quality (adequate temperature, dissolved oxygen, lack of contaminants, nutrients, turbidity) that would provide for a life stage for each of the listed species at a specific location (FWS, 1994). The physical habitat PCE provides spawning, nursery feeding and rearing habitats, or access to those habitats and is found in river channels as well as bottom lands, side channels, secondary channels, oxbows, backwaters and other areas within the 100-year floodplain, which when inundated provides habitats for the species' various life stages (FWS, 1994). Map 3.2-3 identifies the assumed Colorado River 100-year floodplain within the project area.

According to FEMA, the 100-year floodplain associated with the Colorado River extends up the Roan Creek drainage from its confluence with the river upstream for 3.8 miles to the Garfield County border (see Mesa County, 2012a), upstream from the junction of Garfield CR 200 and Mesa County 45 Road (Roan Creek Road). That portion of Roan Creek would be included as critical habitat for Colorado pikeminnow and razorback sucker.

The distribution of humpback chub in 1990 included the Colorado River mainstream reaches in the vicinity of Westwater Canyon, Utah and Black Rocks, Colorado but the distribution does not include the Colorado River upstream (FWS, 1990a, FWS, 2002c). During the 1960s through the early 1980s, adult bonytail were captured in the Upper Colorado River Basin including the Yampa River, Green River and Colorado River mainstem (FWS, 2002d). In 1984, a single bonytail was collected on the Colorado River at Black Rocks (Kaeding et al., 1986). The Colorado River upstream from the confluence with the Gunnison River is not utilized by humpback chub (Valdez et al., 2011). FWS designated critical habitat for the bonytail and humpback chub in river channels and flooded, ponded, or inundated riverine habitats suitable for adults and young on the Colorado River in Mesa County from Black Rocks (River Mile 137) in Ruby Canyon, downstream to Fish Ford River on the Utah-Colorado border (FWS, 1994).

Western Yellow-billed Cuckoo**.** FWS (2001) found that listing the western Distinct Population Segment of yellow-billed cuckoos (including those in Colorado) as threatened was warranted but precluded for listing. Yellow-billed cuckoos are considered a riparian obligate species and are usually found in large tracts of cottonwood/willow habitats with dense sub-canopies, but may also be found in urban areas with tall trees (FWS, 2007a). No known populations of yellow-billed cuckoos exist within the RMPPA. An intensive search for the species was conducted in Dinosaur National Monument and adjacent private lands in 2009 where there are historical records of breeding, but no cuckoos were found (Beason, 2009). Most confirmed observations in Colorado have been on the eastern plains (Kingery, 1998). Riparian cottonwood/willow vegetation along portions of the Colorado River might provide marginal habitat but the species' absence in the region indicates it would not be expected.

Gunnison's Sage-grouse**.** FWS (2010a) determined that listing Gunnison's sage-grouse as threatened or endangered was warranted but precluded by other higher priority actions. Gunnison's sage-grouse were recognized as a separate species from greater sage-grouse in 2000. The Pinon Mesa population of Gunnison's sage-grouse is present in western Mesa County on benches north of the Little Dolores River Canyon, in Fish Park adjacent to the Utah border and on Pinon Mesa east to the Grand Mesa-Uncompahgre National Forest. In pre-settlement times, Gunnison's sage-grouse may have inhabited the region of Horseshoe Canyon (Schroeder et al., 2004), but the closest habitat to the project area that is occupied by Gunnison's sage-grouse is 35 miles to the southwest, on Snyder Flats southwest of Grand Junction.

Greater Sage-grouse. After a 12-month review of newly available information, FWS (2010b) found that listing the greater sage-grouse as threatened or endangered under the ESA throughout its range was warranted but precluded by higher priority listing actions. The FWS indicated that listing the greater sage-grouse under the ESA will be proposed in the future but for the present, the species is a candidate for listing. Greater sage-grouse are considered a sagebrush obligate species (Connelly et al., 2004). Two populations of greater sage-grouse have been defined in western Colorado; one is the Parachute/Piceance/Roan (PPR) population, the other is the Northwest Colorado population. Much of the project area coincides with historical sage-grouse habitat and potential habitat within the PPR population area (Parachute/Piceance/Roan Greater Sage-Grouse Work Group, 2008). The closest lek sites to the project area are approximately 6 miles north on flats of the Roan Cliffs between Conn Creek and Clear Creek. No habitats currently utilized by greater sage-grouse coincide with the project area.

As required under Instruction Memorandum (IM) No. 2012-043, the BLM (2012a) has classified Preliminary Priority Habitat (PPH) and Preliminary General Habitat (PGH) in the region surrounding the project area on public lands. PPH has the highest conservation values to sage-grouse, including breeding, late brood-rearing and winter concentration areas. PGH includes seasonally or year-round occupied habitat outside of priority habitats. PGH has been delineated

less than 1 mile from the Horseshoe Canyon area on benches between Sand Wash and Battlement Mesa. PPH has been delineated on Kimball Mountain, about 6 miles north of Homer Deep Unit. No PPH or PGH coincides with the project area. Biological surveys in this area did not produce any observations of sage-grouse sign in the project area. Previous biological surveys by the same surveyor have revealed grouse sign approximately 6 miles to the north of the Homer Deep Unit, on Kimball Mountain in the area subsequently delineated as PPH habitat for the grouse. Biologists with Rocky Mountain Bird Observatory (RMBO) surveyed the Horseshoe Canyon area for sage-grouse in 2009 but no sage-grouse sign were found in the area (Plank, 2013).

**BLM Sensitive Species**

The BLM (2009b) identified seven species of mammals, 12 birds, three reptiles, three amphibians, five fish and one invertebrate as sensitive species of wildlife known or suspected to occur within the GJFO area, including Garfield and Mesa counties (see Table 3.3-6). Some BLM-sensitive wildlife species are also listed by the state as endangered, threatened or as species of special concern (CPW, 2011a). Additional species that could occur and are listed by the state but have no federal status are included in Table 3.3-6.

Three wildlife species in Table 3.3-6 have been observed within the project area: Brewer's sparrow, midget faded rattlesnake and northern leopard frog. River otters, a state-threatened species, occur within the Colorado River following their release during the 1970s (Boyle, 2006; CPW, 2012a). Other mammalian species listed in Table 3.3-6 that may be present include Townsend's big-eared bat, fringed myotis, big free-tailed bat, Botta's and northern pocket gophers and white-tailed prairie dog. In the eastern portion of the project area, CPW has identified and mapped white-tailed prairie dog habitat along Mesa County 45 and V.2 roads. Some of the sensitive bat species have been observed to the northwest in the Book Cliffs area (Chung-MacCoubrey, 2008).

Brewer's sparrows have been documented in the project area (WestWater Engineering, 2012b and 2012d). They are a sagebrush obligate passerine that is relatively abundant in northwestern Colorado (Boyle and Reeder, 2005). The nesting season extends through early August (Kingery, 1998). Based on Breeding Bird Surveys conducted in the region surrounding the project area, populations of Brewer's sparrows have been decreasing during the past 20 years, from 1991 through 2010 (Sauer et al., 2011). Bald eagles also occur. CPW has mapped bald eagle nesting and winter habitat including winter night roosts along the Colorado River adjacent to the Wagon Track and Horseshoe Canyon areas and winter range extends along Roan Creek and Dry Fork within Homer Deep. Bald eagle active nest sites and winter night roost sites are classified as Sensitive Wildlife Habitats under COGCC Rule 1200 (COGCC, 2009).

Northern leopard frogs were seen in aquatic habitat associated with Dry Fork in the Homer Deep area (WestWater Engineering, 2012a) and one was observed in the Horseshoe Canyon area (WestWater Engineering, 2012d). One midget faded rattlesnake was seen in pinyon-juniper woodland in the Winter Flats area during surveys in 2009 (WestWater Engineering, 2012b) and another in the Horseshoe Canyon area in 2012 (WestWater Engineering, 2012d). Both are BLM-sensitive and state Species of Concern. Bluehead sucker, flannelmouth sucker and roundtail chub have been documented in the Colorado River at Cameo, downstream from Roan Creek (Deacon and Mize, 1997) but they have not been observed within Dry Fork. Speckled dace and northern leopard frog were the only aquatic vertebrate species found in Dry Fork during surveys in April 2012 (Fresques, 2012).

**Table 3.3-6**
**Federal and State of Colorado Sensitive Wildlife Species Not Listed Under the ESA that Could Potentially Occur in the Vicinity of the Project Area**

| Common Name<br>Scientific Name | Habitat [1] | Potential Occurrence [2]<br>Nearest Record | Federal Status [3] | State Status [4] | Global/State Rank [5] |
|---|---|---|---|---|---|
| **Mammals** | | | | | |
| Townsend's big-eared bat<br>*Corynorhinus townsendii pallescens* | Montane forests, pinyon-juniper woodlands, semi-desert shrublands. | Possible<br>Distributed throughout Mesa Co. | BLM-S | SC | G4/S2 |
| Spotted bat<br>*Euderma maculatum* | Ponderosa pine in montane forest, pinyon-juniper woodlands, aspen, semi-desert shrublands. | Unlikely<br>Limited distribution in Mesa Co. | BLM-S | | G4/S2 |
| Fringed myotis<br>*Myotis thysanodes* | Ponderosa pine, greasewood, oakbrush, saltbush shrublands. | Possible<br>Present in Book Cliffs, Mesa Co. | BLM-S | | G4G5/S3 |
| Big free-tailed bat<br>*Nyctinornops macrotis* | Rocky slopes, canyon lands, roosts in crevices. | Possible<br>Present in Book Cliffs, Mesa Co. | BLM-S | | G5/S1 |
| White-tailed prairie dog<br>*Cynomys leucurus* | Open shrublands, arid grass-shrub and mountain valleys mostly in semidesert shrublands, also agriculture/pasture. | Possible<br>Overall range adjacent to project area | BLM-S | | G4/S4 |
| Botta's pocket gopher<br>*Thomomy bottae rubidus* | Agricultural land, grasslands, roadsides, open parklands, pinyon-juniper woodlands, open montane forest, montane shrublands and semidesert shrublands. | Possible<br>Distribution includes western Mesa Co. | | SC | S1 |
| Northern pocket gopher<br>*Thomomys talpoides macrotis* | Many different habitat types including agricultural and pasture lands, semidesert shrublands and grasslands, lower elevations into alpine tundra. | Possible<br>Distributed throughout Mesa Co. | | SC | S1 |
| | | | | | |
| Northern river otter<br>*Lontra* (*Lutra*) *Canadensis* | Riparian habitats and permanent water with abundant fish and/or crustaceans. Present in the Colorado River and Reed Wash. | Present<br>Present in Colorado River | | ST | none |
| Kit fox<br>*Vulpes macrotis* | Semidesert shrubland and margins of pinyon-juniper woodlands; saltbush, sagebrush, greasewood. | Unlikely<br>Overall range south of project area. | BLM-S | SE | G4/S1 |
| Desert bighorn sheep<br>*Ovis canadensis nelson* | Introduced near Colorado National Monument in 1979; steep inaccessible cliffs, areas dominated by grasses. | None<br>Occupied habitat is 18 miles away. | BLM-S | | G4 |
| **Birds** | | | | | |
| American white pelican<br>*Pelecanus erythrorhynchos* | Larger reservoirs, breeding on islands in eastern Colorado. Habitat during migration is present near the Colorado River. | None<br>No records, no habitat present. | BLM-S | | G3/S1B |

| Common Name<br>Scientific Name | Habitat [1] | Potential Occurrence [2]<br>Nearest Record | Federal Status [3] | State Status [4] | Global/State Rank [5] |
|---|---|---|---|---|---|
| Gunnison sage-grouse<br>*Cetrocercus minimus* | Expansive sagebrush with grasses, forbs and healthy riparian ecosystems. | None<br>Occupied habitat is 20 miles away. | BLM-S<br>FC | SC | G1/S1 |
| Greater sage-grouse<br>*Cetrocercus urophasianus* | Sagebrush shrublands, also grasslands, meadows in summer. | Possible<br>Occupied habitat is <1 mile away. | BLM-S<br>FC | SC | G4/S4 |
| Greater sandhill crane<br>*Grus canadensis tabida* | Migrants - mudflats around reservoirs, agriculture, moist meadows. Habitat during migration is present near the Colorado River. | None<br>No records, no habitat present. | | SC | S2B |
| White-faced ibis<br>*Plegadis chihi* | Marsh edges, wet meadows, reservoir shorelines. Habitat during migration is present near the Colorado River. | None<br>No records, no habitat present. | BLM-S | | G5/S2B |
| Bald eagle<br>*Haliaeetus leucocephalus* | Reservoirs, rivers, wintering in semidesert and grasslands. | Present<br>Occupied nesting, winter habitat in project area. | BLM-S | SC | G5/S3N |
| Northern goshawk<br>*Accipiter gentilis* | Forests of aspen, ponderosa pine, lodgepole pine. | None<br>No records, no habitat present. | BLM-S | | G5/S3B |
| Ferruginous hawk<br>*Buteo regalis* | Grassland, semidesert shrublands, rare in pinyon-juniper. Nests on isolated structures. | Possible<br>Potential nesting habitat on Book Cliffs, Mesa Co. | BLM-S | SC | G4/S3B |
| American peregrine falcon<br>*Falco peregrinus anatum* | Open conifer forests, riparian forests and cliffs; migrant in western Colorado. | Possible<br>Potential nesting habitat 2 miles away. | | SC | G4/S2B |
| Western burrowing owl<br>*Athene cunicularia* | Grasslands in or near prairie dog towns. Potential habitat is <1 mile away. | Possible<br>Prairie dog habitat <1 mile away | BLM-S | ST | G4/S4B |
| Long-billed Curlew<br>*Numenius americanus* | Short-grass grasslands, wheat fields, dry land agriculture near water. Habitat during migration is present near the Colorado River. | None<br>No records, no habitat present. | BLM-S | SC | G5/S2B |
| Western snowy plover<br>*Charadrius alexandrinus nivosus* | In Mesa County, migrants on mudflats and sandy shorelines of lower Gunnison River and Colorado River. | Unlikely<br>No records, no habitat present. | BLM-S | SC | G4/S1B |
| Western yellow-billed cuckoo<br>*Coccyzus americanus occidentalis* | Lowland cottonwood/willow riparian forests with dense sub-canopies and urban areas with tall trees. | Unlikely<br>No records, no habitat present. | BLM-S<br>FC | SC | G5Q/SNA |
| Brewer's sparrow<br>*Spizella breweri* | Mostly in sagebrush shrubland but also in mountain mahogany and rabbitbrush; mesas and foothills. | Present<br>Observed nesting on-site. | BLM-S | | G5/S4B |
| **Reptiles** | | | | | |
| Longnose leopard lizard<br>*Gambelia wislizenii* | Flat or gently sloping, open ground shrublands. | Possible<br>Suitable habitat present | BLM-S | SC | G5/S1 |

| Common Name<br>Scientific Name | Habitat [1] | Potential Occurrence [2]<br>Nearest Record | Federal Status [3] | State Status [4] | Global/State Rank [5] |
|---|---|---|---|---|---|
| Milk snake<br>*Lampropeltis triangulum taylori* | Grasslands, sandhills, canyons, open woodlands ponderosa, pinyon-juniper. Not distributed in western Garfield County. | Possible<br>Suitable habitat present. | BLM-S | SC | G5/S1 |
| Midget faded rattlesnake<br>*Crotalus oreganus concolor* | Most terrestrial habitats in western and west-central Colorado. | Present<br>Documented on-site. | BLM-S | SC | G5/S3 |
| **Amphibians** | | | | | |
| Great Basin spadefoot toad<br>*Spea intermontana* | Pinyon-juniper woodlands, sagebrush, semidesert shrublands, stream floodplains, canyon bottoms. | Possible<br>Record in project area (CNHP). | BLM-S | | G5/S3 |
| Canyon treefrog<br>*Hyla arenicolor* | Intermittent streams in deep, rocky canyons with pinyon-juniper vegetation. | Unlikely<br>Record 15 miles away (CNHP). | BLM-S | | G5/S2 |
| Northern leopard Frog<br>*Rana pipiens* | Margins, banks of marshes, ponds, streams, other permanent water. | Present<br>Documented on-site. | BLM-S | SC | G5/S3 |
| **Fish** | | | | | |
| Colorado River cutthroat trout<br>*Oncorhynchus clarkii pleuriticus* | Colorado River drainage, clear water with gravel bottoms in small headwater streams; spawns from April to June. | Unlikely<br>Present in upper Roan Creek drainage | BLM-S | SC | G4/S3 |
| Roundtail chub<br>*Gila robusta* | Colorado River drainage, mostly large rivers, also streams and lakes. Spawns in early summer after spring runoff. | Present<br>Colorado River | BLM-S | SC | G3/S2 |
| Bluehead sucker<br>*Catostomus discobolus* | Headwater streams to large rivers with moderate velocity, not in standing water; prefers rock substrate. Spawns in spring or summer. | Present<br>Colorado River | BLM-S | SC | G4/S4 |
| Flannelmouth sucker<br>*Catostomas latipinnis* | Larger streams and rivers with riffles, eddies, backwaters. Spawns early May to early August. | Present<br>Colorado River. | BLM-S | | G3G4/S3 |
| Mountain sucker<br>*Catostomas platyrhynchus* | Smaller rivers and streams with gravel, sand, mud bottoms, in areas of moderate current. | None<br>Not in Mesa Co. | BLM-S | SC | G5/S2 |
| **Invertebrates** | | | | | |
| Great Basin Silverspot Butterfly<br>*Speyeria nokomis nokomis* | Spring-fed meadows, seeps, marshes, boggy streamside meadows with flowing water; bog violets are larval food plants. | None<br>Record 40 miles away (CNHP). | BLM-S | | G4/S1 |

[1] Sources: CPW, 2012a; Andrews and Righter, 1992; Hammerson, 1986; Woodling, 1985; Fitzgerald et al., 1994; Chung-MacCoubrey, 2008.
[2] Potential Occurrence:
Unlikely: May or may not occur in Garfield and/or Mesa counties but no suitable habitat
Possible: Occurs in Garfield and/or Mesa counties, suitable habitat is present, but not observed in project area
[3] Federal Status: FC = Federal Candidate, BLM-S = BLM Sensitive.
[4] State Status: SC = State Species of Special Concern, SE= State Endangered , ST = State Threatened
[5] Colorado Natural Heritage Program ranks:
Global Rank: G1 = Critically Imperiled, G2= Imperiled, G3= Vulnerable, G4 = Apparently Secure, G5 = Widespread, abundant. Q = Questionable Taxonomy
State Rank: S1= Critically Imperiled, S2= Imperiled, S3= Vulnerable, S4 = Apparently Secure. A “B” after the rank indicates the rank applies to Breeding Habitat

### 3.3.4.2 Environmental Consequences

**Proposed Action Alternative**

**Threatened, Endangered and Candidate Species**

The only species listed under the ESA that would be potentially affected by the Proposed Action are the four endangered Colorado River fish species. The only candidate species that would be potentially affected by the Proposed Action is the greater sage-grouse.

**Colorado River Fish**. The endangered fish species could be affected through one or more of the following pathways:

1. Water depletions from the Colorado River system.
2. Decreased water quality from mobilized selenium in the Colorado River and tributaries that would be affected by construction of the Proposed Action.
3. Direct water withdrawal from critical habitat in the Colorado River with potential impingement and entrainment in pump intakes of larval or juvenile endangered species.
4. Hazardous materials (diesel fuel, lubricants and herbicides) affecting tributaries crossed by the Proposed Action and critical habitats downstream in the Colorado River.

Water Depletions. In May 2008, the BLM prepared a Programmatic Biological Assessment (PBA) that addresses water depleting activities associated with the BLM's fluid minerals program in the Colorado River Basin in Colorado. In response to the BLM's PBA, the FWS issued a Programmatic Biological Opinion – PBO (ES/GJ-6-CO-08-F-0006, FWS, 2008a) on December 19, 2008, which determined that the BLM water depletions from the Colorado River Basin are not likely to jeopardize the continued existence of the Colorado pikeminnow, humpback chub, bonytail, or razorback sucker and that the BLM water depletions are not likely to destroy or adversely modify designated critical habitat.

A Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin was initiated in January 1988. The Recovery Program serves as the reasonable and prudent alternative to avoid jeopardy and provide recovery to the endangered fishes by depletions from the Colorado River Basin. The PBO addresses water depletions associated with fluid minerals development on BLM-administered lands, including water used for well drilling, hydrostatic testing of pipelines and dust abatement on roads. The PBO includes reasonable and prudent alternatives developed by the FWS which allow the BLM to authorize oil and gas wells that result in water depletion while avoiding the likelihood of jeopardy to the endangered fishes and avoiding destruction or adverse modification of their critical habitat. As a reasonable and prudent alternative in the PBO, the FWS authorized the BLM to solicit a one-time contribution to the Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin (Recovery Program) in the amount equal to the average annual acre-feet depleted by fluid minerals activities on BLM-administered lands.

The average annual depletion associated with the Proposed Action (361 acre-feet) would be entered into the BLM GJFO fluid minerals water depletion log which would be submitted to the BLM Colorado State Office at the end of the Fiscal Year.

Decreased Water Quality. Selenium is a semi-metallic trace element that is widely distributed in Upper Cretaceous and Tertiary marine sedimentary rocks in the Western United States (BOR et al., 1998). Selenium is an essential trace element for animals in small amounts but exposures to slightly higher amounts is toxic to vertebrates, often compounded by bioaccumulation of selenium through terrestrial and aquatic food chains (Hamilton, 2004; BOR et al., 1998; Lemly, 1993 and 1996; Peterson and Nebeker, 1992).

High concentrations of selenium have been found in Colorado pikeminnows inhabiting the Colorado River downstream from the Grand Valley Diversion dam at Palisade (Osmundson et al., 2000). The levels of selenium in muscle tissue of pikeminnows in the river exceeded levels recognized as toxic to fish (Lemly, 1993; Lemly 1996). Selenium concentrations at low levels (2 to 5 µg/L) in water can affect fish reproduction and populations, but higher selenium levels (10 to 20 µg/kg of body weight) in fish tissues could result in teratogenesis, or abnormal embryonic developmental, in embryos (BOR et al., 1998; Lemly, 1996).

More than 90 percent of all proposed surface disturbances would be to selenium-containing (seleniferous) and salt-bearing geologic strata including the Hunter Canyon Formation, the Wasatch Formation and recent alluvial deposits and landslides. Runoff from these strata has been related to elevated loads of salt and selenium concentrations in the Upper Colorado River Basin (Lieb et al., 2012). Water quality in Dry Fork is included in Colorado's Section 303(d) list of impaired waters due to concentrations of selenium (CDPHE, 2012a). Additional surface disturbances within the Homer Deep area could increase selenium concentrations in Dry Fork and downstream in Roan Creek. Critical habitat for Colorado pikeminnow and razorback sucker extends to Roan Creek and water quality in the water PCE could be affected by increased selenium concentrations.

Selenium-laden sediment could also be mobilized during pipeline construction across drainages, if water was present. Dry open-cut pipeline construction, whether by flume or by dam-and-pump, would be expected to generate less suspended sediment than wet open-cut construction (Trettel et al., 2002; Reid et al., 2004). Dry-open cut construction would be implemented if water was present in drainages at the time of construction.

Application of measures proposed in the Biological Resources Protection Plan and site-specific SWMPs and BMPs would help minimize potential discharge of selenium-bearing sediments during construction and operational activities. Surface disturbing actions on soils derived from the Hunter Canyon Formation, the Wasatch Formation and recent alluvial deposits and landslides could increase selenium concentrations above acute (18.4 µg/L) or chronic (4.6 µg/L) standards (CDPHE, 2012c) in Dry Fork and affect endangered Colorado River fish and critical habitat in Roan Creek and the Colorado River, downstream from the project area.

Entrainment, Impingement. Fish, particularly juveniles, might be susceptible to entrainment and impingement at pump water intakes. Entrainment occurs when a fish is diverted into the pump intake (usually fatal) while impingement occurs when the water flow velocity at the intake exceeds the swimming ability of fish, trapping them against the pump intake screen, usually resulting in injury (National Marine Fisheries Service, 2011). Impact due to entrainment and impingement of fish on pump intake screens depends on size of the fish, its swimming ability and behavior in the vicinity of the intake as well as the water velocity, flow and depth, screen mesh size and design of the water intake (Canada Department of Fisheries and Oceans, 1995).

The FWS (2008a) discussed how water pumped directly out of the Colorado River and other rivers with critical habitat occupied by the endangered Colorado River fish species would directly impact the listed species. The FWS (2008a) provided measures to minimize direct impact to the listed fish species that were committed to implementation by eight western slope BLM field offices. These measures are included in the Biological Resource Protection Plan (Appendix E).

Hazardous Materials. Diesel fuel spills could affect freshwater stream macroinvertebrates for more than one year after a spill and could affect aquatic substrates, and thus fish spawning, incubating and rearing habitats for much longer periods (Lytle and Peckarsky, 2001). Application of measures proposed in the Biological Resources Protection Plan and SWMPs would minimize potential for inadvertent fuel spills or release of other hazardous materials that

might affect endangered Colorado River fish and designated critical habitat downstream from the project area.

Herbicides. Control of noxious weeds on ground surfaces disturbed by the Proposed Action could require the use of several commercial herbicides that might present a high toxicity risk to endangered fish species (e.g., Fairchild, 2003), although some herbicides are practically non-toxic to fish (Washington State Department of Transportation, 2011b). Application of measures proposed by in the Biological Resources Protection Plan and Integrated Noxious and Invasive Weed Management Plan such as avoiding application of herbicides within 100 feet of wetlands and floodplains would minimize the potential effects of herbicides on endangered Colorado River fish and designated critical habitat downstream from the project area.

**Greater Sage-Grouse**. Potential habitat for the PPR population occurs within the project area based on the occurrence of sagebrush understory that could be enhanced with restoration treatments (Parachute/Piceance/Roan Greater Sage-Grouse Work Group, 2008). The Proposed Action would affect sagebrush-dominated habitat.

Indirect effects include changes in habitat quality or suitability, predation and disease resulting from energy development (Naugle et al., 2009). Project effects to sage-grouse, if they occur within the project area, could include 1) displacement from occupied habitats whether due to human presence, machinery, or noise; 2) alteration of vegetation including short-term effects (until interim reclamation) to herbaceous vegetation and longer-term effects to sagebrush and other shrubs (longer than 2 years); 3) short-term effects to vegetation due to fugitive dust; 4) long-term effects to soils and vegetation due to soil compaction and destruction of biologic soil crusts; 5) degradation of affected vegetation by invasive noxious weeds; 6) fragmentation of thermal and hiding cover; and 7) attracting predators of sage-grouse and nests to the project area. Corvids, including ravens, are effective nest predators of greater sage-grouse, taking eggs and possibly recently hatched chicks and their abundance has been related to higher nest predation rates of sage-grouse (Hagen, 2009) and are often attracted to areas of human development (Marzluff and Neatherlin, 2006). Abundance of common ravens has been increasing in the region during the past 20 years (see Section 3.3.6, Migratory Birds).

Black Hills would confine all trash in a covered container, and would promptly remove and haul it to an authorized disposal site (Biological Resource Protection Plan, Appendix E) to minimize attracting corvids and other potential predators to work areas. Location of the Proposed Action adjacent to existing disturbances (i.e., gathering pipelines adjacent to existing access roads and pipeline corridors; well pads placed adjacent to access roads or incorporating existing well pad pads) would help minimize fragmentation of potential sage-grouse habitat.

**BLM and State Special Status Species**

Special status animal species that were observed or could occur in the project area (listed as "present" or "possible" in Table 3.3-6), including white-tailed prairie dog, northern and Botta's pocket gophers, river otter, midget faded rattlesnake and long-nosed leopard lizard are discussed here. Effects to BLM-sensitive bird species observed within the project area (Brewer's sparrow, bald eagle, ferruginous hawk, peregrine falcon, burrowing owl) and appropriate conservation measures are discussed in Section 3.3.6, Migratory Birds. Habitat loss, increased fragmentation, temporary animal displacement and possible direct impacts to individuals (e.g., mortality, salt toxicosis and harassment) are possible.

Construction under the Proposed Action would remove approximately 268 acres of habitat that could be used by special status species, including previously disturbed areas. Special status species could be displaced from habitats that are cleared of vegetation and from adjacent habitats. Previously disturbed vegetation would become reestablished to some degree within

one to three growing seasons after construction but shrub-dominated habitat would take longer (Section 3.3.2, Vegetation). Displacement from adjacent habitats could also be a short-term effect once construction and revegetation of disturbed areas was complete and successful and once human activity was absent. Removal of pinyon-juniper woodland and big sagebrush shrubland would cause long-term effects, possibly affecting summer and/or winter bat roosts, cavity-nesting species and sagebrush-dependent species (see Table 3.3-6).

Some special status wildlife species could be directly impacted by construction of proposed well pads, centralized facilities, pipelines and roads if they are killed by vehicles traveling to and from construction sites. Species most susceptible to vehicle-related mortality include those that are inconspicuous (lizards, frogs, snakes and small mammals) and those with limited mobility (amphibians). Observing speed limits and limiting most construction traffic the hours between 10 a.m. and 3 p.m. from December 1 to May 1 and to daylight hours the rest of the year (Biological Resource Protection Plan) would help minimize the potential for vehicle collisions with special status species.

Direct effects to fossorial species (those living underground) such as the white-tailed prairie dog, pocket gophers and Great Basin spadefoot toad could also occur during construction. Prairie dogs often burrow in previously disturbed areas (Koford, 1958; Knowles, 1982). Direct mortality could also occur during construction (mowing or brush-hogging).

Fluids pits would contain high concentrations of dissolved salts that could be toxic (salt toxicosis) to a variety of sensitive species (burrowing mammals, bats, migratory birds, reptiles and amphibians included in Table 3.3-6) if the saline water was ingested (Meteyer et al., 1997; Bollinger et al., 2005). Fluids pits would be fenced and covered with netting to prevent wildlife access (Biological Resource Protection Plan).

Effects to northern leopard frogs in Dry Fork, bluehead sucker, flannelmouth sucker and roundtail chub downstream in Roan Creek and the Colorado River could occur due to increased salt loads and selenium concentrations, similar to effects described for Colorado pikeminnows. Larval amphibians and fish could be similarly entrained or impinged on pump intakes by water withdrawals from surface water and be affected by hazardous materials (diesel fuel, lubricants and herbicides) affecting tributaries crossed by the Proposed Action and habitats downstream in the Colorado River. Application of measures in the Biological Resources Protection Plan, SWMPs and Weed Management Plan could minimize potential for contaminated surface runoff, inadvertent fuel spills and/or release of other hazardous materials that might affect sensitive aquatic species present within or downstream from the project area.

**Protective/Mitigation Measures**

The proposal includes multiple measures to minimize impacts to special status animal species.

- See Biological Resources Protection Plan (Appendix E) for details.

The following GJFO Standard COAs support protection of special status animal species.

- The operator will minimize or preclude releases of hydrocarbons into open pits. Unless the authorized officer approves the release, no oil should go into a pit except in an emergency. The operator must remove any hydrocarbons (oil, condensate, paraffin, diesel, etc.) introduced to a pit within 24 hours of discovery.
- The operator will prevent wildlife and livestock access (including avian wildlife) to fluids pits that contain or have the potential to contain salinity sufficient to harm wildlife or livestock, to contain hydrocarbons, surfactants, or Resource Conservation and Recovery Act-exempt hazardous substances.

- For reserve pits, fence all four sides as soon as the pit is constructed. Reconstruct any damage to the rig side of the fence immediately following release of the drilling rig. At a minimum, the operator will adequately fence all fluids pits and open cellars during and after drilling operations until the pit is free of fluids and the operator initiates backfilling.
- Fencing for pits and other facilities with potential to cause harm to big game and other wildlife will be 8-foot woven wire fence with adequate bracing. Construct the fence at least 2 feet from the edge of the pit. The bottom 2 feet of mesh will be no larger than 1½ inch openings, to preclude small animals from entering the pit. All corners will be braced and fence construction will be on cut or undisturbed ground. The fence will be maintained erect and in good condition to exclude wildlife and livestock. (Fencing: BLM Manual Handbook H-1741-1, p. 16).
- All open top tanks and pits will be covered or netted to eliminate any hazard to birds and flying mammals (CERCLA Section 101(14)). At a minimum, the operator will install approved netting in these circumstances, immediately following release of the drilling rig. Note: The BLM does not approve flagging, strobe lights, metal reflectors or noisemakers to deter wildlife.

- Minimum Netting Requirements: The operator will:
  - Construct a rigid structure of steel tubing or wooden posts with cable strung across the pit no further apart than 7-foot intervals along the X- and Y-axes to form a grid of 7-foot squares.
  - Suspend netting a minimum of 4 to 5 feet above the pit surface.
  - Use a maximum netting mesh size of 1½ inches to allow for snow loading while excluding most birds in accordance with Fish and Wildlife Service recommendations. Refer to: http://www.fws.gov/mountain-prairie/contaminants/contaminants1c.html.
  - Cover the top and sides of the netting support frame with netting and secure the netting at the ground surface around the entire pit to prevent wildlife entry at the netting edges.
  - Note: Other fencing or a wire mesh panel with openings larger than 1½ inches does not sufficiently exclude small wildlife and songbirds unless covered by smaller meshed netting.
  - Monitor and maintain the netting sufficiently to ensure the netting is functioning as intended, has not entrapped wildlife and is free of holes and gaps greater than 1½ inches.
- Any wildlife or birds found dead or apparently ill in or near pits must be reported to the Grand Junction Field Office immediately.
- If the operator discovers a dead or injured federally protected species (i.e., migratory bird species, bald or golden eagle, or species listed by the FWS as threatened or endangered) in or adjacent to a pit, trench, tank, exhaust stack, or fence. (If the operator is unable to contact the FWS Law Enforcement office, the operator must contact the nearest FWS Ecological Services office.)
- Any lined pit, any pit constructed with a slope steeper than 3:1, or where entrapment hazards may exist, will include escape ramps or ladders installed every 50 feet along the slope and at each corner. Example: anchored sections of galvanized chain-link fence at

least 24 inches wide extending from the bottom of the pit to the top of the pit slope and across the top edge of the pit liner for at least two feet.

In addition to project design features and the BLM GJFO Standard COAs listed above, the BLM would require the following measure to further mitigate impacts to ESA and Sensitive Animal Species under the Proposed Action:

- Temporary fencing should be installed on the open sides of the fluid pits prior to drilling. The temporary fencing should be replaced with more permanent fence, as discussed above.

The BLM would require the following measures listed by the FWS in their concurrence letter (see Appendix K). Most of the measures have been included as design features by Black Hills (see Biological Resources Protection Plan – Appendix E):

- If water is extracted from within critical habitat, extraction procedures should follow conservation measures to qualify for ESA section 7 consultation compliance under the 2008 PBO including, but not limited to the following conservation measures:
    - Screening of pump intakes with ¼ inch (or finer) mesh;
    - Placing the pump intake into faster moving water;
    - Pumping from off-channel locations without a connection to the river.
- Pipelines should not cross the Colorado River.
- No riparian vegetation should be affected within the 100-year floodplain of the Colorado River.
- Water should not be withdrawn from a Colorado Department of Transportation (CDOT) pond near Interstate-70 which is used as a razorback sucker rearing habitat.

**No Action Alternative**

Under the No Action Alternative, there would be none of the direct and indirect effects to endangered Colorado River fish species and their designated critical habitats, or BLM and state special status animal species that would occur by implementing the Proposed Action.

### 3.3.5 Threatened, Endangered, Candidate and Sensitive Plant Species (Includes a Finding on Standard 4)

#### 3.3.5.1 Current Conditions

**Threatened, Endangered and Candidate Species.** The FWS (2012a) identified four plant species listed under the ESA that potentially occur in Mesa and Garfield counties (see Table 3.3-7). No candidate plant species were identified in Mesa or Garfield counties.

**Table 3.3-7**
**ESA-Listed Endangered and Threatened Species for Listing**
**Under the ESA that are Known or Have Potential to Occur within the Project Area**

| Species Common Name, Scientific Name | ESA Status [1] | Species and Critical Habitat (CH) Listed in County | |
|---|---|---|---|
| | | Mesa, CO | Garfield, CO |
| Parachute Beardtongue<br>*Penstemon debilis* | FT | | Yes<br>CH |
| Ute Ladies'-tresses Orchid<br>*Spiranthes diluvialis* | FT | | Yes |
| DeBeque Phacelia<br>*Phacelia submutica* | FT | Yes<br>CH | Yes<br>CH |
| Colorado Hookless Cactus<br>*Sclerocactus glaucus* | FT | Yes | Yes |
| [1] FWS, 2012a. | | | |

Parachute Beardtongue. Parachute beardtongue was listed as threatened on July 27, 2011 (FWS, 2011b). This plant is found in isolated populations on white shale talus in the Mahogany Zone of the Parachute Creek Member of the Green River Formation (Lyon et al., 2001) at elevations between 8,000 and 9,000 feet (FWS, 2011b), which does not occur in the project area (Hail and Smith, 1997). This species has an extremely limited range and is known only to occur in shale talus slopes of the Roan Cliff from the Logan Mountain-Mount Callahan area east to the Anvil Points area, north of Interstate-70 near Rulison, Colorado (Lyon et al., 2001). Mount Logan is over 4.5 miles northeast of the project area. The closest designated critical habitat unit for Parachute beardtongue (Unit 2; FWS, 2012c) is approximately 2 miles north of the Homer Deep Unit boundary. No plants were documented during project surveys (WestWater Engineering, 2010, 2011a, 2011b, 2011c, 2012a, 2012b, 2012c and 2012d) and the species is not expected to be present within the project area.

Ute Ladies'-tresses. Ute-ladies' tresses orchid was listed as threatened in 1992 (FWS, 1992). The species occurs in seasonally flooded riparian and sub-irrigated meadow habitats (FWS, 1992). In 2006, Ute ladies'-tresses orchid was found within the Roaring Fork River valley near Carbondale in Garfield County on seasonally sub-irrigated meadows that were dominated by herbaceous riparian species within the BLM Glenwood Springs Field Office (DeYoung, 2009); however, Ute ladies'-tresses orchid has not been considered as "present" in the GJFO RMPPA (BLM, 2009a). Portions of project area that coincide with the Colorado River floodplain are below 5,000 feet in elevation. Generally, sites in western Colorado that are below 5,000 feet elevation are unsuitable for Ute-ladies'-tresses orchid (Mayo, 2009). No plants were documented during project surveys (WestWater Engineering, 2010, 2011a, 2011b, 2011c, 2012a, 2012b, 2012c and 2012d) and the species is not expected to be present within the project area.

Colorado Hookless Cactus. Colorado hookless cactus is a federally-listed threatened plant (FWS, 1979, 2007b and 2009) that occurs on river benches, valley slopes and rolling hills in Delta, Garfield, Mesa and Montrose counties, Colorado (FWS, 1990b). Colorado hookless cactus generally grows on soils that are unusually coarse, gravelly river alluvium above river floodplains and usually with Mancos shale with volcanic cobbles and pebbles as components on the surface (FWS, 2010c). There are two population centers in Colorado, one of which occupies alluvial river terraces of the Colorado River and in the Plateau of Roan Creek drainages in the vicinity of De Beque, Colorado, including the project area, and the other which is located on alluvial river terraces of the Gunnison River extending from Delta, Colorado to southern Mesa County. Recent research by the Denver Botanic Gardens has determined that the two populations are genetically distinct (McGlaughlin and Ramp-Neale, 2012). Approximately

19,000 individuals are estimated within the two populations (FWS, 2010c). No critical habitat has been designated or proposed for this species.

The Colorado hookless cactus is a perennial herb that produces pink flowers in April and May, with fruiting extending from May through June. Reproduction is predominantly sexual, although individuals may sprout multiple stems. Several species of ground nesting bees, flies and ants are believed to be the primary pollinators for the cactus (FWS, 1990b).

Records compiled by the Colorado Natural Heritage Program (CNHP, 2012) indicate that Colorado hookless cactus has been found in the vicinity of the project area, including the following conservation sites (Lyon et al., 1996): Sulphur Gulch, Pyramid Ridge, Coon Hollow, and Pyramid Rock on the west side of the Colorado River and Atwell Gulch, DeBeque Cutoff and Jerry Gulch on the east side of the Colorado River. Botanical surveys conducted from 2009 through 2012 (WestWater Engineering, 2009b, 2010, 2011a, 2011b, 2012a, 2012b, 2012c and 2012d) within the project area where surveys were permitted documented more than 817 individual Colorado hookless cactus plants, of which half are located along the Winter Flats Road. Previous survey efforts conducted prior to 2009 had documented additional cacti within the area; however, recent surveys (2009 through 2012) did not observe the cacti and as a result are not included in the total cacti documented within the project area. In 2012, the Pine Ridge wildfire burned over 16 known cacti within the vicinity of the project area (Fresques and Holsinger, 2012).

DeBeque Phacelia. DeBeque phacelia was listed as threatened on July 27, 2011 (FWS, 2011b). DeBeque phacelia is an annual species endemic to Colorado and is found exclusively on sparsely vegetated, steep slopes in brown or gray clay on Atwell Gulch and Shire members of the Wasatch Formation within a 20-mile radius of De Beque, Colorado (FWS, 2011b). The expansive clay soils are found in moderately steep slopes, benches and ridge tops and have high shrink-swell potential that create large cracks in the surface to provide suitable substrate for seed dormancy and plant growth (FWS, 2012c). DeBeque phacelia is currently known only to occur in Garfield and Mesa counties within an elevation range of 4,600 to 7,450 feet (FWS, 2011b).

In 2012, the FWS (2012c) designated 25,484 acres of critical habitat for DeBeque phacelia within nine units in Garfield and Mesa counties, including the project area; all units are known to be occupied (see Map 3.3-1). PCEs identified by the FWS (2012c) for DeBeque phacelia critical habitat include: 1) colorful exposures of chocolate to purplish brown, dark charcoal gray and tan clay soils in the Atwell Gulch or Shire members of the Wasatch Formation; 2) moderately steep slopes (2 to 42 degrees; average 14 degrees), benches and ridge tops adjacent to valley floors; 3) elevations from 4,600 to 7,450 feet; 4) less than 20 percent plant cover in barren areas within pinyon-juniper woodlands, mixed salt desert scrub and big sagebrush shrublands; and 5) areas with the above PCEs that are free from moderate to heavy disturbance when soils are dry and free from all disturbances when soils are wet.

DeBeque phacelia does not necessarily appear every year. Seeds can remain dormant for 5 years or longer, until the combination and timing of temperature and precipitation are optimal for germination (FWS, 2011b). Depending on growing conditions, the estimated number of plants fluctuates from 7,767 to 68,371 per year (FWS, 2011b). During typical years, seeds germinate in early April, plants flower from late April through late June and fruits develop from mid-May through late June (FWS, 2011a). Once an individual's life cycle ends in late June or early July, the plant quickly deteriorates with little or no evidence of existence (Ladyman, 2003).

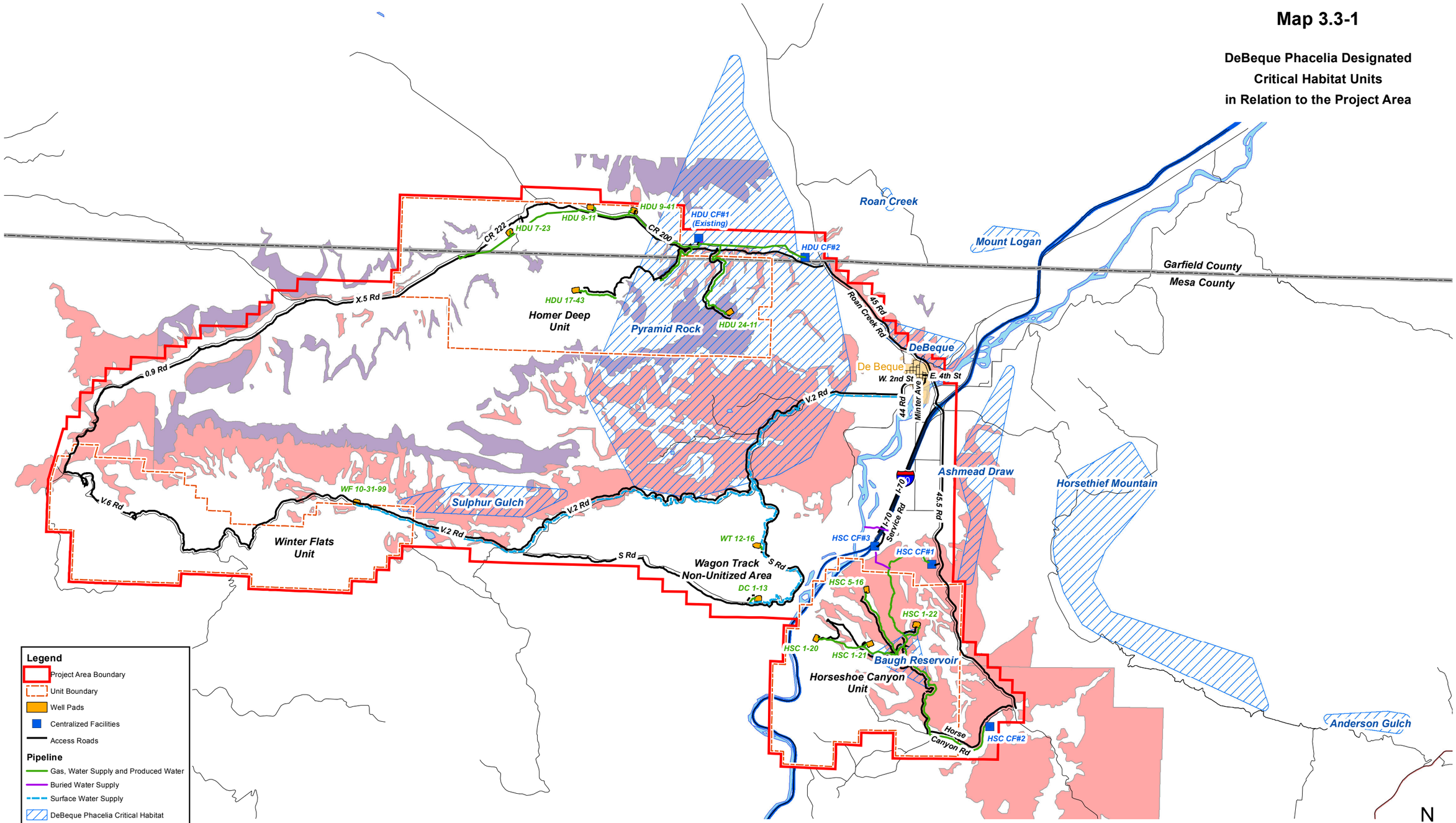
Surveys for DeBeque phacelia were conducted for this project in 2010, 2011 and 2012 within the project area on Atwell Gulch and Shire members of the Wasatch Formation (see Map 3.3-1) on at least 3,291 acres where surveys were permitted (WestWater Engineering, 2010, 2011a, 2011b, 2011c, 2012a, 2012b, 2012c and 2012d). Surveys identified and accessed suitable habitat in the project area. Suitable habitat delineated in the project area was classified as highly suitable or marginally suitable based on draft guidance provided by the FWS in 2012. Survey efforts in 2010 and 2011 documented DeBeque phacelia plants in the project area when conditions were favorable for phacelia to grow; however, absence of plants during those survey years did not discount areas identified as suitable for phacelia. Approximately 38.62 acres within 122 individual areas (or sites) were identified as suitable DeBeque phacelia habitat during survey efforts for this project, including one site (0.03 acre) in the Homer Deep area that was identified as potentially suitable within areas where surveys were not permitted. "Potential habitat" was assessed within areas where surveys permission was not granted from aerial photography and observation from access roads. Other surveys for DeBeque phacelia plants and habitat have occurred within the project area and have delineated suitable DeBeque phacelia habitat. Some of these areas were redefined and/or incorporated into the habitat delineated by WestWater Engineering for this project. Some areas were not delineated as suitable phacelia habitat during survey efforts for this project, considering new FWS DeBeque phacelia habitat guidance (FWS, 2012c). In one instance, previously FWS-delineated habitat (0.88 acre; BLM, 2012d) was included as suitable DeBeque phacelia habitat for this project because the private landowner denied survey access and the site could not be surveyed and/or revisited.

**BLM Sensitive Species**. The BLM (2012b; Appendix B) identified 22 species of sensitive vascular plants that are known or could occur within the GJFO area (see Table 3.3-8). Surveys for sensitive plant species have been conducted in all or portions of the project area since 2009 (WestWater Engineering, 2009b, 2010, 2011a, 2011b, 2012a, 2012b, 2012c and 2012d): hundreds of DeBeque milkvetch were found along Winter Flats Road, and it has been found within the Winter Flats and Wagon Track areas; Naturita milkvetch is prevalent within the Homer Deep, Horseshoe Canyon and Wagon Track areas.

Available information from the Colorado Natural Heritage Program (CNHP) and records from Colorado State University Herbarium (CSUH), University of Colorado Herbarium (CUH) and the Rocky Mountain Herbarium (RMH) indicate that another sensitive plant species, Piceance bladderpod, has been documented within 2.5 miles from the project area; one record on Cow Ridge to the north and another on Horse Mountain to the west of the Homer Deep area. Occurrence of nine other sensitive species within the project area is possible, based on the species' known distributions and/or characteristic habitat associations (see Table 3.3-8). However, no Piceance bladderpod or other sensitive plant species were observed within the project area during biological surveys conducted in 2009, 2010, 2011 and 2012 (WestWater Engineering, 2009b, 2010, 2011a, 2011b, 2012a, 2012b, 2012c and 2012d).

## Map 3.3-1

**DeBeque Phacelia Designated Critical Habitat Units in Relation to the Project Area**




NOTE:
The extent of Atwell Gulch and Shire members are not shown on the map outside of the Project area.

No warranty is made by the Bureau of Land Management for use of the data for purposes not intended by the BLM

**Table 3.3-8**
**BLM-Sensitive Vascular Plant Species Not Listed Under the ESA that Could Potentially Occur in the Vicinity of the Project Area**

| Common Name<br>Scientific Name | Habitat [1] | Potential Occurrence [2]<br>Nearest Record | Federal Sensitive | Global/State Rank[3] |
|---|---|---|---|---|
| Narrowstem gilia<br>*Aliciella (Gilia) stenothysra* | Silt, loam, gravel soils from Green River/Uinta Formation; 5,000-6,000 feet. | Possible<br>Record in project area (CNHP) | BLM | G3/S1 |
| Jones blue star<br>*Amsonia jonesii* | In runoff-fed draws on (Mancos Formation) sandstone, desert-steppe, rocky gorges, canyons, 4,500 to 5,000 feet. | Possible<br>13 miles away (CNHP) | BLM | G4/S1 |
| DeBeque milkvetch<br>*Astragalus debequaeus* | Varicolored, fine-textured, seleniferous, saline soils of Wasatch Formation-Shire Member; 5,100-6,400 feet. | Present<br>Observed in project area | BLM | G2/S2 |
| Horseshoe milkvetch<br>*Astragalus equisolensis* (*Astragalus desperatus* var. *neeseae*) | Dolores River Canyon, sagebrush, greasewood, mixed desert shrub, on Duchesne River Formation. | Unlikely<br><17 miles away (CSUH) | BLM | G5/S1 |
| Grand Junction milkvetch<br>*Astragalus linifolius* | Pinyon-juniper, sagebrush on Chinle, Morrison Formation; 4,800-6,200 feet. | Unlikely<br><20 miles away (CUH) | BLM | G3/S3 |
| Ferron's milkvetch<br>Astragalus musiniensis | Pinyon-juniper, desert shrub on shale, sandstone, or alluvium; 4,700-7,000 feet. | Possible<br><20 miles away (CSUH, CUH, RMH) | BLM | G3/S1 |
| Naturita milkvetch<br>Astragalus naturitensis | Pinyon-juniper woodlands, sandstone mesas, ledges, crevices; 5,000-7,000 feet. | Present<br>Observed in project area | BLM | G2G3/S2S3 |
| Fisher milkvetch<br>Astragalus piscator | Sandy, gypsiferous soils in valley benches, gullied foot hills; 4,300-5,600 feet. | Unlikely<br>46 miles away (CNHP) | BLM | G1/S1 |
| San Rafael milkvetch<br>Astragalus rafaelensis | Gullied hills, washes, tallus, seleniferous clay, silt, sand; 4,400-6,500 feet. | Unlikely<br>46 miles away (CNHP) | BLM | G3/S1 |
| Grand Junction suncup<br>*Camissonia eastwoodiae* | Adobe hills, clay soil, in lower valleys, near Utah border; Mesa County and Delta County; 4,800-5,800 feet. | Possible<br>8 miles away (CNHP) | BLM | G2/S1 |
| Gypsum Valley cateye<br>*Cryptantha gypsophila* | In gypsum soils with other selenium-tolerant species (i.e., Atriplex); 5,700-6,400 feet. | Unlikely<br>42 miles away (CSUH) | BLM | G1G2/S1S2 |
| Osterhout's cryptantha<br>*Cryptantha* (*Oreocarya*) *osterhoutii* | Dry, barren sites in red-purple decomposed sandstone; 4,500-6,100 feet. | Possible<br>18 miles away (CSUH, CUH) | BLM | G3/S1S2 |
| Kachina fleabane (daisy)<br>*Erigeron kachinensis* | Found on saline sols in alcoves and seeps in canyon walls, Montrose County and eastern Utah: 4,800-5,600 feet. | Unlikely<br>48 miles away (CUH) | BLM | G2/S1 |
| Grand buckwheat<br>*Eriogonum contortum* | Mancos Shale badlands, shadscale, other salt desert shrubs; 4,500-5,100 feet. | Possible<br>9 miles away (CNHP)) | BLM | G3/S2 |
| Tufted green gentian (Frasera)<br>*Frasera paniculata* | Western Mesa County; near Utah border, sandy soils in desert shrub, pinyon-juniper. 4,000-6,500 feet. | Unlikely<br>48 miles away (CUH) | BLM | G4/S1 |

| Common Name<br>Scientific Name | Habitat [1] | Potential Occurrence [2]<br>Nearest Record | Federal Sensitive | Global/State Rank[3] |
|---|---|---|---|---|
| Piceance bladderpod<br>*Lesquerella parviflora* | Shale in Green River Formation, ledges, canyon slopes; 6,200-8,600 feet. | Possible<br>Records <2.5 miles from project area (CUH) | BLM | G2/S2 |
| Wideleaf bisquitroot (Canyonlands lomatium)<br>*Lomatium latilobum* (*Aletes latilobus*) | Pinyon-juniper, desert shrub, sandy soils from Entrada Formation; 5,000-7,000 feet. | Unlikely<br>19 miles away (CSUH) | BLM | G1/S1 |
| Dolores River skeleton plant<br>*Lygodesmia doloresensis* | Endemic to Dolores River Valley on benches between canyon walls and river. 4,000-5,500 feet. | Unlikely<br>10 miles away (CNHP) | BLM | G1G2/S1 |
| Roan Cliffs blazingstar<br>*Mentzelia rhizomata*<br>[*Nuttallia* (*Mentzelia*) *argillosa*] | Steep talus of Green River Formation shale, Roan Cliffs in Garfield County; 5,800-9,000 feet. | Possible<br>10 miles away (RMH) | BLM | G2/S2 |
| Eastwood monkey-flower<br>*Mimulus eastwoodiae* | Shallow caves, seeps, in canyon walls; 4,700-5,800 feet. | Unlikely<br>39miles away (CSUH, CUH) | BLM | G3G4/S1 |
| Aromatic Indian breadroot<br>*Pediomelum aromaticum* | Sandy soils, barren hills, in sagebrush, pinyon-juniper, Montrose-southern Mesa counties; 5,000-5,600 feet. | Possible<br>16 miles away (CNHP) | BLM | G3/S2 |
| Cathedral Bluff (Sun-loving) meadowrue<br>*Thalictrum heliophilum* | Sparsely vegetated, steep shale talus slopes of the Green River Formation; 6,300-8,800 feet. | Possible<br>5 miles away (CNHP) | BLM | G2/S3 |

[1] Sources: CNHP, 2012; Colorado State University Herbarium (CSUH); University of Colorado Herbarium (CUH); Rocky Mountain Herbarium (RMH), Colorado Natural Heritage Program (CNHP) records.

[2] Potential Occurrence:
Unlikely: May or may not occur in Garfield and/or Mesa counties but no suitable habitat.
Possible: Occurs in Garfield and/or Mesa counties, suitable habitat is present, but species not observed in project area.
Likely: Occurs In Garfield and/or Mesa counties, including the project area and/or immediate vicinity.

[3] Colorado Natural Heritage Program Ranks:
Global Rank: G1 = Critically Imperiled, G2= Imperiled, G3= Vulnerable, G4 = Apparently Secure, G5 = Widespread, abundant.
State Rank: S1= Critically Imperiled, S2= Imperiled, S3= Vulnerable, S4 = Apparently Secure.

**Public Land Health Standard 4 (Special Status, Threatened and Endangered Animal and Plant Species)**

Standard 4 - Special status, threatened and endangered species (federal and state), and other plants and animals officially designated by the BLM and their habitats are maintained or enhanced by sustaining healthy, native plant and animal communities.

A Land Health Assessment for the DeBeque/Roan Creek landscape area, evaluated in 2004 and 2006 (BLM, 2009a), indicated that there was a general lack of monitoring data needed to detect trends in rare plant populations. The Assessment did note that there was no evidence of livestock trampling. Alternatively, there was some livestock herbivory of Adobe thistle (a sensitive species at the time) and evidence that infestations of cheatgrass could affect the landscape area from meeting Standard 4 in the future. The current Assessment indicated that Standard 4 was being met (BLM, 2009a).

The BLM recently conducted a Land Health Assessment within the Big Park grazing allotment that coincides with the Horseshoe Canyon area. Approximately half of BLM-administered lands that are not meeting standards or that are meeting standards but with problems are generally a

result of noxious weed infestations, especially cheatgrass, and loss of perennial vegetation and general plant diversity.

#### 3.3.5.2 Environmental Consequences

**Proposed Action Alternative**

The Proposed Action could affect special status plant species through one or more of the following pathways:

1. Direct mortality of plants and/or destruction of seed banks during clearing and grading, construction and reclamation.
2. Fragmentation and isolation of existing populations and areas of suitable habitat.
3. Damage or mortality of plants and/or seed banks due to increased off-road vehicle use in the project area.
4. Increased human access to occupied habitats and destruction of plants through illegal collection.
5. Increased populations of invasive noxious weed species that interfere with growth and survival of special status plants.
6. Damage or mortality of individual plants by dust deposited on photosynthetic surfaces during construction and operation.
7. Changes in characteristics (shade, temperature, soil moisture, species composition, etc.) that alters suitable habitat.
8. Loss of pollinators due to habitat alteration, dust and/or increased presence of invasive, noxious weeds.
9. Accidental release of toxic compounds during construction and/or operation.

These pathways are consistent with criteria developed cooperatively by federal agencies (BLM and FWS) to address impacts to listed plant species in Colorado. In Colorado, the FWS and the BLM (2007) recommended avoiding surface disturbances within 100 meters (328 feet) of habitat occupied by Colorado hookless cactus and BLM sensitive species where possible and where geography and other resources allow. For all other ESA-listed threatened, endangered, proposed and candidate plant species, including DeBeque phacelia, FWS and BLM (2007) recommended avoiding surface disturbing activities within 200 meters (656 feet) of suitable and occupied habitat where possible and where geography and other resources allow. The same document recognized that disturbance closer than 20 meters from a listed plant could be considered an adverse effect. More recent draft guidance from the FWS (Glenne, 2012) has suggested that effects to Colorado hookless cactus and DeBeque phacelia could extend out 300 meters, with adverse effects possible within 100 meters of proposed disturbance. These draft guidelines (Glenne, 2012) are similar to information presented in the Colorado hookless cactus recovery outline (FWS, 2010c) and the final rule designating critical habitat for DeBeque phacelia (FWS, 2012c). Consultation with the FWS would consider the following criteria in determining effects to listed plants for this Proposed Action (Sharp, 2012):

- Colorado hookless cactus: effects to cactus could occur at distances to 100 meters from proposed disturbance, with adverse effects within 20 meters.
- DeBeque phacelia: effects to phacelia could occur at distances to 200 meters from proposed disturbance, with adverse effects within 100 meters.

In some instances, the FWS and the BLM (2007) have considered proposed disturbances within 20 meters of listed plants to not have an adverse effect if existing disturbance was between the Proposed Action and plants or if the listed plant was screened from proposed disturbance.

**ESA-Listed Plant Species**

The BLM GJFO submitted a PBA to the FWS Western Colorado Ecological Services Field Office requesting informal ESA consultation for the Proposed Action. The PBA describes expected effects to ESA-listed species and provides conservation measures to prevent adverse effects to ESA-listed species. Site-specific minimization measures are included in the PBA to avoid or minimize direct, indirect and cumulative impacts to ESA-listed plant species. In the event that the Proposed Action changes as a result of the BLM on-site inspections or other resource issues in the vicinity of ESA-listed species, the conservation measures outlined in the PBA would be implemented to prevent adverse effects to ESA-listed species; such site-specific minimization measures would be resubmitted to the FWS, if necessary. However, if changes to the project could not incorporate the conservation measures outlined in the PBA to prevent adverse effect to ESA-listed species, Section 7 consultation would be reinitiated.

**Colorado Hookless Cactus**. Direct effects to Colorado hookless cactus could occur within 20 meters of the Proposed Action, which could result in loss or degradation of cactus populations, decreased cactus seed production, decreased recruitment and increased occurrence of plant damage or individual mortality. Impacts could include removal or crushing of individual plants during road, pipeline, well pad and centralized facility construction. Increased fugitive dust from construction and operation of the Proposed Action, especially increased traffic along existing access roads could increase existing impacts to cacti within 20 meters of the activities. Dust could impair photosynthesis, gas exchange, transpiration, use efficiency, leaf morphology and stomata function (Farmer, 1993; Sharifi et al., 1997; Rai et al., 2009).

Indirect impacts to Colorado hookless cactus plants are expected within 100 meters of the Proposed Action (see FWS and BLM, 2007) and could occur from heavy dust created during construction and use of access roads, changes in hydrology and soil characteristics, an increase in noxious weeds and alterations of vegetation cover and species composition. Dust from construction and related traffic could also interfere with cactus reproduction by affecting pollinators during the flowering season. Soil compaction at well pads would result in a change in soil hydrology, possibly indirectly altering vegetation composition that might compete with the Colorado hookless cactus. Access roads are designed and maintained (i.e., crowned) to have water flow off the road, potentially affecting local hydrology in cactus habitat. Introduction or an increase in noxious weeds could alter vegetation cover and species composition, potentially out-competing the cactus. Recent monitoring studies conducted by the Denver Botanic Gardens in the project area determined that population growth rates of Colorado hookless cactus within the vicinity of natural gas development are similar to growth rates elsewhere in the range and appear stable. However, correlations between distance from disturbance and plant size up to 100 meters from oil pads and up to 150 meters from roads have been documented. Data to determine the causation between disturbance and age structure is not conclusive (McGlaughlin and Ramp-Neale, 2012).

Botanical survey efforts from 2009 through 2012 in the project area have documented over 613 Colorado hookless cactus plants within 100 meters of project components that could be affected by construction- and operation-related activities. At least 96 Colorado hookless cactus plants were documented within 20 meters of proposed gathering pipeline disturbances, existing access roads and the temporary surface water pipeline route (see Table 3.3-9); however, disturbance associated with the Proposed Action would be no closer to the documented plants than pre-existing disturbance. One area along the existing access road to well pad HDU 17-43 has a high density of cacti in close proximity to the road near an intersection. Currently, permanent cable-and-fence posting is in place at the intersection; extending the post-and-cable fencing along the access road to well pad HDU 17-43 would help to minimize incidental crushing of the documented cactus plants from construction and other vehicular traffic. Table 3.3-9 summarizes

the number of Colorado hookless cactus plants within 100 meters of the Proposed Action. No cactus plants were documented within proposed surface disturbance limits; therefore, no plants would be directly removed by the Proposed Action.

**Table 3.3-9**
**Summary of Colorado Hookless Cactus Plants within 100 meters of Proposed Disturbance [1]**

| Proposed Project Component | Number of Plants < 20m | Number of Plants > 20m but < 100m | Total Number of Plants < 100m of Proposed Action [6] |
|---|---|---|---|
| Well Pads / Centralized Facilities | 0 | 3 | 3 |
| Other Proposed Development [2,3] | 26+ | 146+ | 172+ |
| Temporary Surface Water Line [2, 4] | 0 | 306 | 306 |
| Existing Access Roads [2,3,5] | 95+ | 460+ | 555+ |
| Proposed Action Total [6] | 96+ | 517+ | 613+ |

[1] Colorado hookless cactus locations determined from survey efforts conducted in 2009 through 2012 where survey permission was granted (WestWater Engineering, 2009b, 2010, 2011a, 2011b, 2011c, 2012a, 2012b, 2012c and 2012d).
[2] Other proposed development includes new and improved roads and gathering pipelines. The temporary surface water pipeline and access roads that do not need improvement are included separately.
[3] "+" indicates an area delineated with high cacti density in which more than 25 plants were documented within one area; 25 cacti have been included in the plant total.
[4] Approximately 17.2 miles (of 19.0 miles) of temporary surface water line within the range of the cactus (below 6,500 feet) have been surveyed.
[5] Approximately 49.3 miles of access roads (existing, needing improvements and proposed) within the range of the cactus (below 6,500 feet) have been surveyed. Many of the cacti identified also are included in totals identified within the proposed development.
[6] Proposed Action considers all cactus plants within 100 meters of the well pads, centralized facilities, other proposed development, temporary surface water line and existing access roads, without overlap.

Approximately 472 acres within the potential elevational range of Colorado hookless cactus and within 100 meters of proposed disturbance have not been surveyed on private lands. This includes habitat in the Homer Deep, Wagon Track and Horseshoe Canyon areas where gathering pipelines have been proposed, as well as habitat within the vicinity of the temporary surface water pipeline. Black Hills would have a biological monitor present to identify and avoid or minimize effects to Colorado hookless cactus during pipeline alignment and construction/placement, which may include minor alteration of the pipeline alignment or minimization of the pipeline construction corridor, if practical (see Biological Resources Protection Plan, Appendix E). Some surveys in 2012 occurred outside of the Colorado hookless cactus flowering season; these areas should be resurveyed in 2013 within staked well pad disturbance limits and pipeline corridors during the flowering season and prior to ground-disturbing activities to confirm absence of cactus plants.

Application of measures in the Biological Resources Protection Plan, SWMPs and the Transportation Plan would be expected to minimize or avoid direct and indirect effects to Colorado hookless cactus plants within 100 meters of the Proposed Action. It is not expected that the Proposed Action would significantly affect the Colorado hookless cactus population within the project area. On February 15, 2013, the FWS concurred with BLM's determination that the Proposed Action is "not likely to adversely affect the Colorado hookless cactus (see Appendix K).

**DeBeque Phacelia**. Direct and indirect effects to DeBeque phacelia habitat and/or plants would be expected at distances up to 200 meters, similar to effects discussed above for Colorado hookless cactus. Surface-disturbing activities related to the Proposed Action within suitable habitat could directly impact DeBeque phacelia by killing plants, removing dormant seeds in the ground and modifying habitat so that it was no longer suitable for DeBeque phacelia to grow. Heavy dust created during construction and use of access roads from construction and operation traffic, changes in hydrology and soil characteristics, increased noxious weed infestations and alterations of vegetation cover and species composition could also affect DeBeque phacelia. Due to the life history of the plant, effects from fugitive dust would be more significant if DeBeque phacelia are present and flowering (April through late June).

Surveys within the project area identified approximately 12.36 acres of suitable DeBeque phacelia habitat (87 sites ranging in size from <0.01 acre to 2.78 acres) within 200 meters of proposed disturbance, including the proposed route for the temporary surface water pipeline that could be affected by construction and operation of the Proposed Action. Two sites within 20 meters and 100 meters of proposed gathering pipelines are known to be occupied within the Homer Deep area. Fifty-three sites (9.04 acres) occur within 100 meters of proposed gathering pipelines or the temporary surface pipeline, including 33 sites (7.97 acres) within Pyramid Rock and Baugh Reservoir critical habitat units (see discussion, below) and could be affected by the Proposed Action. Proposed disturbance within 100 meters of suitable habitat would not be closer to suitable habitat than existing disturbance (roads and pipeline disturbances). In the Horseshoe Canyon area where DeBeque phacelia habitat occurs within 100 meters on both sides of the road in a few locations, the pipelines would be placed in the existing road and road widths would be maintained. Table 3.3-10 identifies the type of habitat, the number of sites and area of suitable habitat located within 200 meters of the Proposed Action. No suitable phacelia habitat was documented within proposed surface disturbances; therefore, no direct effects to DeBeque phacelia plants or habitat would be expected. Placement of the temporary surface water pipeline within the roadside ditch is not expected to affect suitable DeBeque phacelia habitat and/or plants within 100 meters of the pipeline route.

Approximately 165.5 acres within Atwell Gulch and Shire members of the Wasatch Formation that occur within 200 meters of proposed gathering lines in Homer Deep and Horseshoe Canyon areas and within 200 meters of the temporary surface water pipeline have not been surveyed. In these areas, surveyors assessed potential suitable habitat from access roads and aerial photography; no potential habitat was identified within proposed surface disturbance. Black Hills would have a biological monitor present during pipeline alignment in areas that survey access was not permitted. If suitable DeBeque phacelia habitat is documented during pipeline alignment and construction/placement the pipeline alignment may be slightly altered and/or pipeline construction corridor may be reduced, if practical (Biological Resources Protection Plan).

**Table 3.3-10**
**DeBeque Phacelia Suitable Habitat within 200 meters of the Proposed Action**

| Proposed Project Component | Suitable Habitat Type | Within 20 meters of Proposed Disturbance | | Within 20 to 100 meters of Proposed Disturbance | | Within 100 to 200 meters of Proposed Disturbance | |
|---|---|---|---|---|---|---|---|
| | | Sites | Acres | Sites | Acres | Sites | Acres |
| Well Pads/Centralized Facilities | Highly | 0 | N/A | 0 | N/A | 2 | 0.17 |
| | Marginally | 0 | N/A | 0 | N/A | 1 | 0.12 |
| Other Proposed Development [2] | Highly | 4 | 0.14 | 13 | 2.91[6] | 7 | 0.85 |
| | Marginally | 3 | 0.09 | 23 | 1.26 | 14 | 1.00 |
| Temporary Surface Water Line [2, 3] | Highly | 0 | N/A | 5 | 4.05 | 8 | 0.91 |
| | Marginally | 1 | 0.21 | 3 | 0.38 | 3 | 0.17 |
| Existing Access Roads [2, 4] | Highly | 6 | 1.35[6] | 17 | 5.81 | 15 | 1.73 |
| | Marginally | 4 | 0.29 | 27 | 1.72 | 11 | 0.52 |
| Proposed Action Total [5] | Highly | 6 | 1.35[6] | 17 | 5.81 | 17 | 2.09 |
| | Marginally | 4 | 0.29 | 27 | 1.72 | 16 | 1.10 |

[1] DeBeque phacelia suitable habitat delineated during survey efforts conducted in 2010 through 2012 where survey permission acquired (WestWater Engineering, 2010, 2011a, 2011b, 2012a, 2012b, 2012c, 2012d).
[2] Other proposed development includes new and improved roads and gathering pipelines. The temporary surface water pipeline and access roads that do not need improvement are included separately.
[3] Approximately 17.2 miles (of 19.0 miles) of temporary surface water line have been surveyed.
[4] Approximately 49.3 miles of access roads (existing, needing improvements and proposed)) have been surveyed. Most of the phacelia habitat identified is also included in totals identified within the proposed development.
[5] Proposed Action considers all DeBeque phacelia habitat within 200 meters of the well pads, centralized facilities, other proposed development, temporary surface water line and existing access roads, without overlap.
[6] Acreage and site count includes one area (0.88 acre) of suitable and occupied habitat delineated by the FWS in 1986 (BLM, 2012d) that was not accessible during survey efforts for the Proposed Action.

Application of measures in the Biological Resources Protection Plan, SWMPs and the Transportation Plan would be expected to minimize or avoid direct and indirect effects on DeBeque phacelia, if present, and its habitat within 100 meters of the Proposed Action.

Critical Habitat. Approximately 79.01 acres of surface disturbance would occur within two designated critical habitat units: Pyramid Rock located in Homer Deep area and Baugh Reservoir located in the Horseshoe Canyon Unit. Additionally, 3.47 miles of Pyramid Rock critical habitat unit would be crossed by the temporary surface water pipeline to the Winter Flats Unit. Table 3.3-11 summarizes the effects to designated DeBeque phacelia critical habitat from the Proposed Action. Although the Proposed Action would remove 79.01 acres within designated critical habitat units and the temporary surface water pipeline would be installed within the Pyramid Rock critical habitat unit, no PCEs (based on DeBeque phacelia suitable habitat delineated during survey efforts), as described above in Section 3.3.5.1, would be directly affected by construction or operation of the project within designated critical habitat units.

**Table 3.3-11**
**Acres of Designated DeBeque Phacelia Critical Habitat Affected by the Proposed Action**

| Proposed Action Component | DeBeque Phacelia Critical Habitat Affected (Acres) |
|---|---|
| ***Pyramid Rock Critical Habitat Unit (Homer Deep Development Area)*** | |
| Well Pad 24-11 | 9.66 |
| Centralized Facility #2 | 12.81 |
| Gathering Pipelines and/or Road Improvements | 38.86 |
| Resource Road Construction | 0.29 |
| *Pyramid Rock Total* | *61.62* |
| ***Baugh Reservoir (Horseshoe Canyon Development Area)*** | |
| Gathering Pipelines and/or Road Improvements | 17.06 |
| Resource Road Construction | 0.33 |
| *Baugh Reservoir Total* | *17.39* |
| **Overall Total** | **79.01** |

The FWS (2012c) has recognized that disturbances within 100 meters (328 feet) of DeBeque phacelia suitable habitat could adversely modify PCEs from potential disturbances including dust, pollutants, changes in erosion and sedimentation, habitat degradation, an increase in nonnative species and increased fire risk. No PCEs have been identified within 100 meters of proposed well pads or centralized facilities; however, 7.97 acres (33 sites) identified as suitable habitat for DeBeque phacelia occur within 100 meters of proposed gathering pipelines or the temporary surface water pipeline within Pyramid Rock and Baugh Reservoir critical habitat units. Table 3.3-12 identifies the type of habitat, the number of sites and area of suitable habitat located within Pyramid Rock and Baugh Reservoir critical habitat units within 100 meters of the Proposed Action.

**Table 3.3-12**
**DeBeque Phacelia Suitable Habitat within 100 meters of the Proposed Action**

| Suitable DeBeque Phacelia Habitat Type | Pyramid Rock CHU | | Baugh Reservoir CHU | |
|---|---|---|---|---|
| | Number of Sites | Acres | Number of Sites | Acres |
| **Gathering Pipelines** | | | | |
| Highly Suitable | 8 | 2.38[1] | 5 | 0.28 |
| Marginally Suitable | 3 | 0.11 | 10 | 0.59 |
| ***Sub-Total*** | ***11*** | ***2.49*** | ***15*** | ***0.87*** |
| **Temporary Surface Water Line** | | | | |
| Highly Suitable | 5 | 4.05 | 0 | 0 |
| Marginally Suitable | 2 | 0.56 | 0 | 0 |
| ***Sub-Total*** | ***7*** | ***4.61*** | ***0*** | ***0*** |
| **Total** | **18** | **7.10** | **15** | **0.87** |

[1] Acreage includes one area (0.88 acre) of suitable and occupied habitat delineated by the FWS in 1986 (BLM, 2012d) that was not accessible during survey efforts for the Proposed Action.

The FWS (2012c) has identified special management considerations to balance conservation of the DeBeque phacelia with energy development and minimize effects to the species and its habitat including: 1) placement of roads and utility lines away from the species and its habitat and 2) minimization of habitat fragmentation. Conservation measures included in the Biological Resources Protection Plan (Appendix E) incorporate the special management considerations to reduce or avoid effects to DeBeque phacelia critical habitat. On February 15, 2013, the FWS concurred with BLM's determination that the Proposed Action is "not likely to adversely affect" the DeBeque phacelia or its critical habitat (see Appendix K).

**BLM Sensitive Species**. Of the 22 sensitive vascular plants included in Table 3.3-8, only Naturita milkvetch and DeBeque milkvetch have been found during botanical surveys from 2009 through 2012 (see WestWater Engineering, 2009b, 2010, 2011a, 2011b, 2012a, 2012b, 2012c and 2012d).

Similar to effects described above for the Colorado hookless cactus and DeBeque phacelia, sensitive plants that are "possible" or documented within the project area (see Table 3.3-8) could be directly or indirectly impacted. Direct impacts to sensitive species might include removal or crushing of individual plants as a result of construction or mortality of individual plants might be caused by decreased light transmission if fugitive dust is deposited directly on the plants. These direct impacts are more likely to occur if they are located within 20 meters (66 feet) of the Proposed Action (FWS and BLM, 2007). Indirect impacts to sensitive plant species could also be possible, including those from heavy construction dust and from use of access roads during both construction and operation. Other indirect changes could occur in hydrology, soil characteristics and abundance of pollinators; noxious weeds might increase and vegetation cover and species composition could be altered. Indirect effects to sensitive species could occur out to 100 meters (328 feet) from proposed surface disturbance (FWS and BLM, 2007).

Over 1,070 Naturita milkvetch plants were documented within 20 meters of proposed actions, including along existing roads and could be directly impacted. At least 1,841 additional plants that were documented between 20 meters and 100 meters of the Proposed Action could be indirectly impacted (see Table 3.3-12). These plants were documented within the Homer Deep, Wagon Track and Horseshoe Canyon areas, as well as along the temporary surface water pipeline route, with the highest concentrations documented in the Horseshoe Canyon area. DeBeque milkvetch was generally located along the proposed temporary surface pipeline route, with some populations documented in the Horseshoe Canyon area. Approximately 179 DeBeque milkvetch plants were documented within 20 meters of the temporary surface pipeline alignment and 1,259 plants were documented within 100 meters of the surface pipeline and the Proposed Action in the Horseshoe Canyon area (see Table 3.3-13). Table 3.3-13 summarizes the number of BLM-sensitive plants documented within 100 meters of the Proposed Action.

**Table 3.3-13**
**Summary of BLM-Sensitive Plants Documented[1] within 100 meters of the Proposed Action**

| | Naturita Milkvetch [2] | | | DeBeque Milkvetch [2] | | |
|---|---|---|---|---|---|---|
| **Development Area** | **Within 20m** | **Between 20m and 100m** | **Total Within 100m** | **Within 20m** | **Between 20m and 100m** | **Total Within 100m** |
| Homer Deep | 254+ | 953+ | 1,207+ | | | |
| Winter Flats | | | 0 | | | |
| Wagon Track | 33 | 142 | 175 | | | |
| Horseshoe Canyon | 758 | 400 | 1,158 | | 52 | 52 |
| Surface Pipeline | 25 | 346 | 371 | 179+ | 1,207+ | 1,386+ |
| **Total** | **1,070+** | **1,841+** | **2,911+** | **179+** | **1,259+** | **1,438+** |

[1] Documented during survey efforts by WestWater Engineering from 2009 through 2012 (WestWater Engineering, 2009b, 2010, 2011a, 2011b, 2011c, 2012a, 2012b, 2012c and 2012d).
[2] "+" indicates that more than 25 plants were documented within one area.

To avoid direct and indirect effects to Naturita and DeBeque milkvetch plants documented within 100 meters of the Proposed Action, Black Hills would implement the measures described within the Biological Resources Protection Plan (Appendix E), including avoidance of documented plants on BLM-administered lands by at least 20 meters. However, there are areas within the Proposed Action that threatened plant species were present and avoidance of both BLM-sensitive plants and the federally-threatened plants was not feasible. As proposed, approximately 178 Naturita milkvetch plants could be removed by construction of the proposed gathering pipelines in one location in the Horseshoe Canyon area. Reducing the width of the proposed pipeline construction corridor within this area would minimize direct effects to Naturita milkvetch. Also, one well pad as proposed within the Wagon Track area (DC 1-13) would remove approximately 29 Naturita milkvetch plants documented in 2010 (WestWater Engineering, 2010); 122 additional plants were identified within 20 meters of proposed well pad DC 1-13 in 2010 and 2012 during survey efforts (WestWater Engineering, 2010 and 2012c). Surveys on BLM-administered lands were conducted before the Pine Ridge fire that burned vegetation within the Wagon Track area (see Map 3.5-3); it is unknown if the documented Naturita milkvetch plants were burned up, but given the low intensity of the burn and the dormant nature of many of the plants within the burned area, it is expected that habitat will recover to pre-burn conditions quickly (Fresques and Holsinger, 2012). Based on the "pre-burn" density of Naturita milkvetch known within the vicinity of proposed well pad DC 1-13, it is not expected that construction the well pad would adversely affect Naturita milkvetch within the Wagon Track area.

**Protective/Mitigation Measures**

The proposal includes multiple measures to minimize impacts to special status plant species.

- See Biological Resources Protection Plan (Appendix E) for details.

In addition the BLM would require the following measures to further mitigate impacts to threatened, endangered and sensitive plant species:

- An existing cable-and-post fence should be extended along the access route to proposed well pad HDU 17-43 to protect a high density of Colorado hookless cactus plants that have been documented in close proximity to the existing access road. Posts should be capped or filled to mitigate risks to birds.
- Colorado hookless cactus surveys conducted outside of the flowering season should be resurveyed during the 2013 flowering season within the staked well pad and pipeline disturbance limits and prior to ground-disturbing activities to confirm absence of cacti.
- A select number of sites with Colorado hookless cactus and/or DeBeque phacelia should be monitored within varying distances of proposed disturbance every 5 years throughout the life of the project, or at other recommended frequency as determined by monitoring results. The monitoring sites would help to determine long-term effects of the Proposed Action on the ESA-plants and/or habitat, determine effectiveness of conservation measures for future development and develop adaptive conservation measures, if necessary.
    - The selection of sites to be monitored, and the identification of control sites should be coordinated with the FWS.
    - Sample plots should be photographed 1) prior to disturbance, 2) every 5 years after disturbance and 3) at the end of the proposed project (estimated to be 20 years).
    - Plants at each site should be counted, if present, and the health and status of the plants and habitat should be documented.

    - A monitoring report should be submitted to the BLM and the FWS by December 1 of each monitoring year.
- Within the Horseshoe Canyon area, the pipeline disturbance width should be reduced to minimize the number Naturita milkvetch plants removed during pipeline construction. This should be included in the APD at the time of submission.
- Before and after construction of proposed well pad DC 1-13, the documented locations of Naturita milkvetch should be monitored within the disturbance footprint and within 20 meters of the proposed well pad to determine if conservation measures should be adapted to minimize construction effects. Monitoring should occur for 3 years after final well pad reclamation.

The BLM also would require the following measures listed by the FWS in their concurrence letter (see Appendix K). Most for the measures have been included as design features by Black Hills (see Biological Resources Protection Plan – Appendix E):

**Colorado Hookless Cactus:**

- No individuals should be directly affected by project activities.
- Well pads, centralized facilities, and new roads should all be kept further than 20 meters from individual hookless cacti.
- In areas where listed plants occur, buried pipelines should be co-located with existing roads or existing pipeline corridors. This minimizes fragmentation of undisturbed habitats, but can at times lead to the burial of a pipeline closer than 20 meters to a hookless cactus. However, in those cases the pipeline should be buried on the other side of the existing disturbance to maximize the distance between the pipeline and hookless cactus.
- In a few cases within the project area hookless cacti are growing on both sides of an existing road. Where a proposed pipeline follows such an existing road, it should be placed underneath the road surface, rather than to one side.
- No surface-disturbing activities would occur within 100 meters of Colorado hookless cactus plants during the cactus flowering season (April through May) to minimize indirect effects (dust, etc.) to pollinators and cactus reproduction.
- Silt barriers and fugitive dust control (watering roads and surface disturbance; no additives) measures should minimize effects to cactus within 100 meters of existing disturbance that could result from an increase in traffic and construction-related activities.
- Temporary fencing near occupied habitats should be installed prior to project development to prevent trampling by workers or equipment. Fencing should be removed immediately after project activities are complete.
- Permanent deterrent fencing constructed of pipe and cable should be installed along existing roads used for the project where hookless cacti are very close to the road to prevent vehicles from leaving the road and incidentally damaging any plants or their habitats. Posts should be capped or filled to mitigate risks to migratory birds.
- Implementation of a SWMP and installation of hay wattles should minimize or avoid altering hydrologic conditions within 20 meters of documented hookless cactus plants.
- Application of the BLM's Noxious and Invasive Week Management Plan for Oil and Gas Operators should minimize or avoid the introduction or increase in noxious weed species

that could compete with the Colorado hookless cactus. Herbicides should not be used to control weeds within 100 meters of Colorado hookless cactus plants unless approved by BLM. Noxious weeds closer to Colorado hookless cactus plants should be removed by hand prior to soil disturbance to reduce reestablishment and potential re-distribution of weed seed and/or propagules.

- Colorado hookless cactus plants growing within 20 meters of project activities should be monitored annually for a minimum of 3 years after ground-disturbing activities. Additionally, select sites should be monitored every 5 years throughout the life of the project (estimated to be 20 years) to determine long-term effects, if any, on hookless cactus survival and recruitment near the project. Monitoring results should be presented to both the BLM and the FWS.

**DeBeque Phacelia:**

- No individuals should be directly affected by project activities.
- Well pads, centralized facilities, and new roads should all be kept further than 100 m from individual DeBeque phacelia plants and suitable habitats.
- In areas where DeBeque phacelia plants or its suitable habitat occurs, buried pipelines should be co-located with existing roads or existing pipeline corridors. This minimizes fragmentation of undisturbed habitats. However, in one instance this would lead to the burial of a pipeline closer than 20 meters to a patch of occupied DeBeque phacelia habitat and a few other instances closer than 20 meters to patches of suitable habitat (occupancy unknown). In those cases, and other cases where DeBeque phacelia plants or suitable habitats are not quite as close to existing disturbance yet within 100 meters, the pipeline should be buried on the other side of the existing disturbance to maximize the distance between the pipeline and DeBeque phacelia plants and suitable habitats.
- In a few cases within the project area, suitable DeBeque phacelia habitats are found on both sides of an existing road. Where a proposed pipeline follows such an existing road, it should be placed underneath the road surface, rather than to one side.
- No surface-disturbing activities would occur within 200 meters of DeBeque phacelia suitable habitat during the growing/flowering season (April through June).
- Areas within 100 meters of suitable habitat planned for well pads and associated project components, which have not yet been surveyed in a reliable year, should have botanical surveys prior to ground-disturbing activities.
- Silt barriers and fugitive dust control (watering roads and surface disturbance; no additives) measures should minimize effects to DeBeque phacelia within 100 meters of existing disturbance that could result from an increase in traffic and construction-related activities.
- Temporary fencing near occupied habitats should be installed prior to project development to prevent trampling by workers or equipment. Fencing should be removed immediately after project activities are complete.
- Permanent deterrent fencing constructed of pipe and cable should be installed along existing roads used for the project where DeBeque phacelia or its suitable habitats are

very close to the road to prevent vehicles from leaving the road and incidentally damaging any plants or their habitats. Posts should be capped or filled to mitigate risks to migratory birds.

- Implementation of a SWMP and installation of hay wattles would minimize or avoid altering hydrologic conditions within 20 meters of DeBeque phacelia habitats.

- Application of the BLM's Noxious and Invasive Weed Management Plan for Oil and Gas Operators would minimize or avoid the introduction or increase in noxious weed species that could compete with the DeBeque phacelia. Herbicides should not be used to control weeds within 200 meters of DeBeque phacelia suitable habitat unless approved by the BLM. Noxious weeds closer than 200 meters to DeBeque phacelia suitable habitat should be removed by hand prior to soil disturbance to reduce reestablishment and potential re-distribution of weed seed and/or propagules.

- DeBeque phacelia habitats within 100 meters of project activities would be monitored annually for a minimum of 3 years after ground-disturbing activities. Additionally, select sites should be monitored every 5 years throughout the life of the project (estimated to be 20 years) to determine long-term effects, if any, on DeBeque phacelia survival and recruitment, and habitat suitability, near the project. Monitoring results should be presented to both BLM and the FWS.

**No Action Alternative**

Under this alternative, there would be no project-related impacts to endangered, threatened, candidate, or BLM-sensitive plant species on BLM-administered lands from construction or operation of the Proposed Action.

**Finding on the Public Land Health Standard 4 (Special Status, Threatened and Endangered Animal and Plant Species)**

The Proposed Action has the potential to contribute to the DeBeque/Roan Creek landscape not meeting Land Health Standard 4 because new surface disturbances caused by the Proposed Action are potential areas for invasion by noxious weeds, including cheatgrass. With strict reclamation and adherence to the Noxious and Invasive Weed Management Plan for Oil and Gas Operators (BLM, 2007a), the Proposed Action might not further degrade plant communities in the Assessment area.

Habitat degradation from invasive vegetative species could occur (see Section 3.3.1, Invasive, Non-native Species), which could affect special status species in the project area. However, with implementation of minimization measures, management of invasive and noxious weeds, and timely reclamation of the disturbed area, the Proposed Action could have minimal effects on Public Land Health Standard 4 in the project area and vicinity.

Under the No Action Alternative, effects from existing and new surface disturbances (unrelated to the Proposed Action) would continue and could affect Public Land Health Standard 4.

### 3.3.6 Migratory Birds (Includes a Finding on Standard 3)

#### 3.3.6.1 Current Conditions

The Migratory Bird Treaty Act (MBTA) of 1918, as amended, implements treaties for the protection of migratory birds. Executive Order (EO) 13186, issued in 2001, directed actions that would further implement the MBTA. As required by the MBTA and EO 13186, the BLM signed a Memorandum of Understanding (MOU) with the FWS in 2010 which is intended to strengthen

migratory bird conservation efforts by identifying and implementing strategies to promote conservation and reduce or eliminate adverse impacts on migratory birds. At the project level, the BLM should:

- Evaluate the effects of their actions on migratory birds and identify where take reasonably attributable to those actions might have a measureable negative effect on migratory bird populations.
- Develop conservation measures and monitoring of the effectiveness of measures taken to minimize, reduce or avoid unintentional take.
- Consider, to the extent practicable, approaches for identifying and minimizing take that is incidental to otherwise lawful activities including:
    - altering the season of activities to minimize disturbances during the breeding season,
    - retaining the breeding site integrity, especially of sites with long histories of use,
    - coordinating with the FWS when planning projects likely to have a negative effect on migratory bird populations and
    - developing cooperative approaches to minimize negative impacts and maximize benefits to migratory birds.

The focus of the BLM's conservation efforts are on migratory species and some non-migratory game bird species that are listed as Birds of Conservation Concern (BCC). BCC have been identified by the FWS (2008b) for different Bird Conservation Regions (BCR) in the United States. The project area is in BCR 16, the Southern Rockies/Colorado Plateau.

Six of the 27 BCC species within BCR 16 have been observed within the project area: bald eagle, golden eagle, gray vireo, pinyon jay, juniper titmouse and Brewer's sparrow. A golden eagle nest on a cliff-face in Homer Deep was active in 2012 and Brewer's sparrows have been documented nesting in sagebrush shrublands in Winter Flats. Bald eagles have been documented nesting in cottonwood trees on the Colorado River. Pinyon jays, gray vireos and juniper titmouse likely nest in pinyon-juniper woodlands within the project area. Estimates of population trends for pinyon jay and Brewer's sparrow within BCR 16 (Sauer et al., 2011) indicate both species have been declining between 1981 and 2010. Local populations of pinyon jays, Brewer's sparrows and Cassin's finches have been declining over the past 20 years (see Table 3.3-14).

**Table 3.3-14**
**Birds of Conservation Concern within Bird Conservation Region 16 (Southern Rockies/Colorado Plateau) that Occur or Potentially Occur in the Project Area**

| Common Name<br>Scientific Name | Habitat [1] | Present On-site [2] | BCR Trend [3] 1981 to 2010 | Local Trend [4] 1992 to 2011 |
|---|---|---|---|---|
| Bald eagle<br>*Haliaeetus leucocehpalus* | Nests, roosts in large cottonwoods along rivers; near prey or carrion during winter. | Yes | Increasing | Insufficient Data |
| Ferruginous hawk<br>*Buteo regalis* | Nests in isolated trees, rock outcrops, artificial structures, ground near prey base. | No | No Trend | Insufficient Data |
| Golden eagle<br>*Aquila chrysaetos* | Nest on open cliffs and in canyons or in tall trees (cottonwoods) in open country and riparian zones. | Yes | No Trend | Insufficient Data |
| Peregrine falcon<br>*Falco peregrinus* | Nests on high cliff faces, often near water; forages in adjacent habitats. | Yes | No Trend | Insufficient Data |
| Prairie falcon<br>*Falco mexicanus* | Nests in cavities on cliffs, rock outcrops adjacent to open grassland, shrublands. | Yes | No Trend | Insufficient Data |

| Common Name<br>Scientific Name | Habitat [1] | Present On-site [2] | BCR Trend [3] 1981 to 2010 | Local Trend [4] 1992 to 2011 |
|---|---|---|---|---|
| Burrowing owl<br>*Athene cunicularia* | Nests in burrows, especially prairie dog / badger burrows in grasslands, desert shrub. | No | No Trend | Insufficient Data |
| Lewis's woodpecker<br>*Melanerpes lewis* | Nests in open stands of cottonwood riparian or urban stands, also in aspen, oak shrub. | No | No Trend | Insufficient Data |
| Gray vireo<br>*Vireo vicinior* | Nests in open pinyon-juniper stands with mountain mahogany, deciduous shrub interspersed. | Yes | No Trend | Insufficient Data |
| Pinyon jay<br>*Gymnorhinus cyanocephalus* | Nest in pinyon and/or juniper woodlands, feed/cache pinyon nuts, juniper berries. | Yes | Decreasing | Decreasing |
| Juniper titmouse<br>*Baeolophus griseus* | Nests in pinyon and/or juniper open or dense woodlands, often intermixed with Gambel oak. | Yes | No Trend | Insufficient Data |
| Brewer's sparrow<br>*Spizella breweri* | Nests in sagebrush, occasionally greasewood, rabbitbrush in desert valleys. | Yes | Decreasing | Decreasing |
| Cassin's finch<br>*Carpodacus cassinii* | Nests in montane forests with spruce/fir and aspen; also in lower pinyon-juniper woodlands. | No | No Trend | Decreasing |

Notes:
[1] Based on Righter et al., 2004.
[2] WestWater Engineering, 2012a, 2012b, 2012c, 2012d.
[3] Sauer et al., 2011.
[4] Linear trends of birds counted per route averaged for data available on 12 Breeding Bird Survey routes within 50 miles surrounding the project area in Colorado and Utah between 1992 and 2011.

Sixty-two bird species were observed within the project area during 2012 (WestWater Engineering, 2012a, 2012b, 2012c, 2012d), of which 61 species are listed as Nearctic and Neotropical migratory birds by the FWS, Division of Bird Habitat Conservation, pursuant to the Neotropical Migratory Bird Conservation Act and are protected under the MBTA (FWS, 2010d). Nesting chronologies for the 61 migratory species observed were compiled from data in Kingery (1998) and show considerable variation within a species and especially between species. The median date that the 61 species initiate nest building in Colorado is May 12 (range from January 19 to June 13). The median date for fledging young by the 61 species is August 17 (range from June 27 to September 21). Cooper's hawk, red-tailed hawk, great horned owl and long-eared owl nests have been reported within the project area and turkey vultures may also nest in suitable habitats in the project area.

Data compiled for 13 National Biological Survey Breeding Bird Survey (BBS - Sauer et al., 2011) routes within 50 miles from the project area reveal that populations for 12 migratory bird species appear to be increasing, but populations for 28 species have been decreasing during the past 20 years, 1992 to 2011. In addition to the three BCC species with declining local populations, other sagebrush obligate species or species associated with sagebrush steppe and pinyon-juniper woodlands are apparently declining within the local region including red-tailed hawk, common nighthawk, white-throated swift, western wood-pewee, pinyon jay, black-billed magpie, rock wren, mountain bluebird, hermit thrush, sage thrasher, chipping sparrow, vesper sparrow, Lazuli bunting, Brewer's blackbird and brown-headed cowbird.

**Public Land Health Standard 3 (Migratory Birds)**

Standard 3 - Healthy, productive plant and animal communities of native and other desirable species are maintained at viable population levels commensurate with the species and habitat's potential. Plants and animals at both the community and population level are productive,

resilient, diverse, vigorous and able to reproduce and sustain natural fluctuations and ecological processes.

Land Health Assessments for the DeBeque/Roan Creek landscape area were evaluated in 2004 and 2006 (BLM, 2009a). Approximately 17 percent of the area evaluated was not meeting Standard 3, primarily due to invasive cheatgrass and low abundance of perennial plant species. Poorly revegetated surfaces disturbed by oil and gas activities contributed to not meeting the standard. The evaluation concluded that wildlife habitat was degraded and should be improved through protections of soils, restoration of native vegetation and prevention of further weed infestations (BLM, 2009a, Table 3-1).

#### 3.3.6.2 Environmental Consequences

**Proposed Action Alternative**

The FWS has primary responsibility for administering the MBTA, which prohibits taking, killing, or possessing migratory birds, their parts (feathers, talons), nests or eggs. EO 13186 directed federal agencies to avoid take under the MBTA, whether intentional or unintentional (with BCC as priorities) and implementing conservation measures to restore and enhance habitat for migratory birds, including the development of surface operating standards for oil and gas developments, management of invasive species to benefit migratory birds, minimizing/preventing pollution, or detrimental alteration of habitats utilized by migratory birds, among other commitments.

In the 2010 MOU pursuant to EO 13186, the BLM committed to identify where take under the MBTA could be reasonably attributable to agency actions that could have a measurable negative effect on migratory bird populations, focusing first on species of concern, priority habitats and key risk factors. Avoidance implementing actions during nesting seasons is one approach to lessening take. The BLM (2007b) determined that impacts to nesting migratory birds could be minimized or avoided by imposing a timing limitation on use authorizations to mitigate vegetative disturbing activities during the primary portion of the nesting season (May 15 to July 15) when most migratory birds nest, but cautioned that dates should be adjusted for the timing or intensity of breeding activity by BCC and migratory bird species affected by the project and species' environmental conditions (BLM, 2007b). Some BCC observed within the project area are known to fledge young after July 15. In Colorado, young gray vireos fledge by July 27, Brewer's sparrows fledge by August 6, juniper titmice fledge by August 10 and pinyon jays fledge by August 12. However, over half of migratory bird species that could nest within the project area might fledge by July 15 (nest chronology data in Kingery, 1998).

Construction during the core nesting season (May 15 through July 15) could result in nest abandonment, displacement of birds and possible mortality of nestlings, most likely early in the nesting season (egg laying, incubation) than late in the season (Romin and Muck, 2002), although many species will re-nest at alternate sites if abandonment occurs early enough. Risk of mortality of nestlings and dependent fledglings is greater if adults abandon nests late in the season or nests are destroyed prior to fledging young and could increase if predators were attracted to areas occupied by humans (Andren, 1994; Chalfoun et al., 2002). Displacement of nesting migratory birds from adjacent nesting habitats due to noise, human activity and dust associated with natural gas developments could also occur (Ingelfinger and Anderson, 2004; Knick and Rotenberry, 2002). Displacement/avoidance might be short-term if related to noise and human presence or long-term if related to habitat removal, alteration and/or fragmentation (Gilbert and Chalfoun, 2011). Mortality of adult birds can potentially occur if they select hollow metal and plastic pipes (PVC – polyvinyl chloride) or posts to nest in and become trapped (BLM, 2012e).

Additionally, noise produced by machinery and other human activities might interfere with bird vocalizations used for territory establishment, mate attraction and selection, food begging and predator alarms (Marler, 2004). As proposed, vegetation clearing would not occur between May 15 and July 15 (Biological Resources Protection Plan), effectively avoiding the core migratory bird nesting period for most species but might affect late or second nesting attempts. Taking active nests, if it occurs, is not expected to have measurable negative effects on migratory bird populations.

The Proposed Action would affect 287.69 acres (with 10 acre well pads; however, well pads would not exceed 6.8 acres under the Proposed Action) of potentially suitable migratory bird nesting habitat (woodlands, shrublands–disturbed, grasslands, exposed rock and unaltered, forested and non-forested wetland/riparian habitat (see Table 3.3-2). These habitats are expected to support nesting by BCC (e.g., pinyon jay, gray vireo and Brewer's sparrow) and other migratory birds that have been observed in the project area. Successful revegetation could occur within three growing seasons of construction, except in areas of woody or shrub vegetation, which could provide nesting and/or foraging habitat for some passerine migratory species; however, reestablishment of sagebrush and forested habitat would take much longer. Under natural succession regimes it would take at least 20 years to replace a mature sagebrush stand and 100 to 300 years to replace mature pinyon-juniper habitat. Brush-hogging techniques are proposed to leave big sagebrush, greasewood, rabbitbrush and other shrubs roots systems intact and to promote revegetation and increase restoration of potential migratory bird nesting habitat. The Proposed Action could affect bird species through degradation of nesting habitats due to noxious weed infestations that could alter native vegetation cover and plant species composition. Implementation of the Noxious and Invasive Weed Management Plan for Oil and Gas Operators (BLM, 2007a) should minimize weed infestations.

The project would remove vegetation within bald eagle and golden eagle Sensitive Wildlife Habitats, defined under COGCC Rule 1200 (COGCC, 2009). Buffer areas surrounding bald eagle and golden eagle nest sites and a bald eagle winter communal roost site would be affected (see Table 3.3-15). Disturbances associated with construction of the centralized facility, pipeline and road/pipeline would be avoided by timing and spatial constraints: the BLM (2011) recommends avoiding human activities within 0.5 mile of an active bald eagle nest from November 15 through July 31 and within 0.5 mile from an active golden eagle nest from December 15 through July 15. CDOW (2008) recommends no human encroachment from November 15 through March 15 within 0.5 mile of an active bald eagle winter night roost if there is a direct line of sight between the roost and the encroachment activities (or within 0.25 mile if there is no direct line of sight between the roost and the encroachment activities).

Project activities at the centralized facility are not expected to affect occupancy of the bald eagle nest site which is within 0.5 mile from the facility; Interstate-70 intervenes between the nest and proposed facility location and any nesting bald eagles are likely to be habituated to noise, traffic and ongoing human activities within the nest buffer. Nearly half of proposed well pad HDU 24-11 is within the 0.5 mile buffer surrounding a golden eagle nest that was active in 2012 (WestWater Engineering, 2012a).

**Table 3.3-15**
**Proposed Surface Disturbances within Bald Eagle and Golden Eagle Sensitive Wildlife Habitats**

| Development Area/ Sensitive Wildlife Habitat | Area (acres) Affected by Project Component | | | | | |
|---|---|---|---|---|---|---|
| | Well Pads | Centralized Facilities | Pipeline | Road | Road/ Pipeline | Total |
| **Homer Deep** | | | | | | |
| Golden Eagle Active Nest Site Buffer | 4.90 | | | | | 4.90 |
| **Wagon Track** | | | | | | |
| Bald Eagle Winter Night Roost Site Buffer | | | | | 1.99 | 1.99 |
| **Horseshoe Canyon** | | | | | | |
| Bald Eagle Active Nest Site Buffer | | 6.09 | 1.65 | | | 7.74 |

Spatial and timing constraints (see Table 3.3-16) would apply to well pad construction and well drilling. Once operational, noise, traffic and human presence at well pad HDU 24-11 would be considerably reduced. Also, line-of-sight between the well pad and active nest site is obscured by topography and pinyon-juniper woodland vegetation, conditions that would reduce potential impact to nesting golden eagles.

In addition to temporal and spatial buffers for active bald eagle nest sites, the BLM (2011) has draft recommendations applicable to other raptor species observed or likely to occur within the project area (see Table 3.3-16).

**Table 3.3-16**
**Temporal and Spatial Buffers Recommended by the BLM for Raptor Species Known or Likely to Occur within the Project Area**

| Raptor Species | Breeding Season Timing Buffer | Breeding Season Spatial Buffer (mile) |
|---|---|---|
| Bald Eagle | November 15 - July 31 | 0.50 |
| Burrowing Owl | March 15 - August 15 | 0.25 |
| Cooper's Hawk | April 1 - August 15 | 0.25 |
| Ferruginous Hawk | February 1- August 15 | 0.50 |
| Golden Eagle | December 15 - July 15 | 0.50 |
| Great Horned Owl | February 1 - August 15 | 0.25 |
| Long-eared Owl [1] | February 1 to August 15 | 0.25 |
| Peregrine Falcon | March 15 – July 31 | 0.50 |
| Prairie Falcon | March 15 - July 31 | 0.50 |
| Red-tailed Hawk | February 15 - August15 | 0.25 |

[1] Buffers based on Romin and Muck, 2002.

Black Hills would revisit nests documented within 0.5 mile of proposed project components during 2012 surveys to determine status in 2013 prior to construction. If a nest is determined to be occupied, Black Hills would adhere to the spatial and temporal buffers for each species as identified in Table 3.3-15 and the Biological Resources Protection Plan (Appendix E).

### Protective/Mitigation Measures

The following measures are included in Black Hills' proposal, to minimize impacts to migratory birds:

- Black Hills would revisit nests documented within 0.5 mile of proposed project components during 2013 surveys to determine status in 2013 prior to construction. If a nest is determined to be occupied, Black Hills would adhere to the spatial and temporal

buffers for each species as identified in Table 3.3-16 and the Biological Resources Protection Plan.

- Vegetation clearing would not occur between May 15 and July 15 (Biological Resources Protection Plan), effectively avoiding the core migratory bird nesting period for most species but might affect late or second nesting attempts.

The following BLM GJFO Standard COA would be required, to minimize impacts to migratory birds:

- New surface disturbance, especially vegetation removal, will not be allowed between May 15 and July 15, to prevent potential taking of migratory birds and/or eggs, unless otherwise approved in writing by the Grand Junction Field Manager. If surface disturbance is proposed during this period, a written request for exception and a migratory bird survey will be submitted for approval prior to any surface disturbance. If vegetation removal is accomplished prior to May 15, exception may be granted to allow project activities to proceed during the closure period.
- Permanent caps will be placed on or fill placed in any open metal or plastic pipe or post to prevent entrapment of birds.

In addition to the protective measures described above, to further reduce potential impacts to migratory birds the BLM would require the following measure:

- Full raptor surveys should be conducted for any intensive activities occurring more than two nesting seasons after the last survey.

**No Action Alternative**

Under this alternative, there would be no project-related impacts to migratory birds on BLM-administered lands from construction of the Proposed Action.

**Finding on the Public Land Health Standard 3 (Migratory Birds)**

The Proposed Action has the potential to further contribute to the DeBeque/Roan Creek landscape's failure to meet Land Health Standard 3 because new surface disturbances are potential areas for invasion by noxious weeds, including cheatgrass. With adherence to the Noxious and Invasive Weed Management Plan, the Proposed Action might not further degrade plant communities in the project area.

Under the No Action Alternative, effects from existing and new surface disturbances (unrelated to the Proposed Action) would continue and could affect Public Land Health Standard 3.

### *3.3.7* Wildlife (includes fish, aquatic and terrestrial) (Includes a Finding on Standard 3)

#### 3.3.7.1 Current Conditions

**Big Game**. The project area coincides with two mule deer populations and two elk populations, both divided by the Colorado River and Interstate-70. Mule deer population D-41 and elk population E-14 are on the north and west bank of the Colorado River, including the Homer Deep, Winter Flats and Wagon Track areas. Mule deer population D-12 and elk population E-10 are on the south and east bank of the Colorado River, coinciding with the Horseshoe Canyon area.

CPW has defined two Game Management Units (GMUs) coinciding with the project area. GMU 31 includes the Homer Deep, Winter Flats and Wagon Track areas and GMU 42 overlaps the Horseshoe Canyon area. The two GMUs are sub-areas within the different deer and elk populations. Mule deer, elk, mountain lion and black bear are harvested annually in both GMUs.

Harvest data have been reported by CPW (2012b and 2012c) from 2002 to 2011 but there have been no overall trends in total harvest or hunter effort for the four species.

Estimates for the two mule deer populations indicate both have declined during the period from 2004 through 2011. Mule deer population D-41 was 11,720 deer in 2004 and was 8,120 in 2011; population D-12 was 26,260 in 2004 and was 19,210 in 2011. Both elk populations have increased during the same time period. Elk population E-10 was 8,840 in 2004 and was 11,980 in 2011; population E-14 was 11,570 in 2004 and was 17,610 in 2011.

CPW (2012d) has defined expected distributions of big game on winter ranges under different winter conditions:

- Winter range is utilized by 90 percent of the population during an average five out of ten winters.
- Winter concentration areas are smaller areas within winter range where animal densities are (at least) 200 percent greater than the density on surrounding winter range during an average five of ten winters.
- Severe winter ranges are sub-areas within winter range where wintering animals are highly concentrated (severe winter ranges support 90 percent of the population) during the most severe two out of ten winters (when snowpack depths are greatest and/or temperatures are lowest).

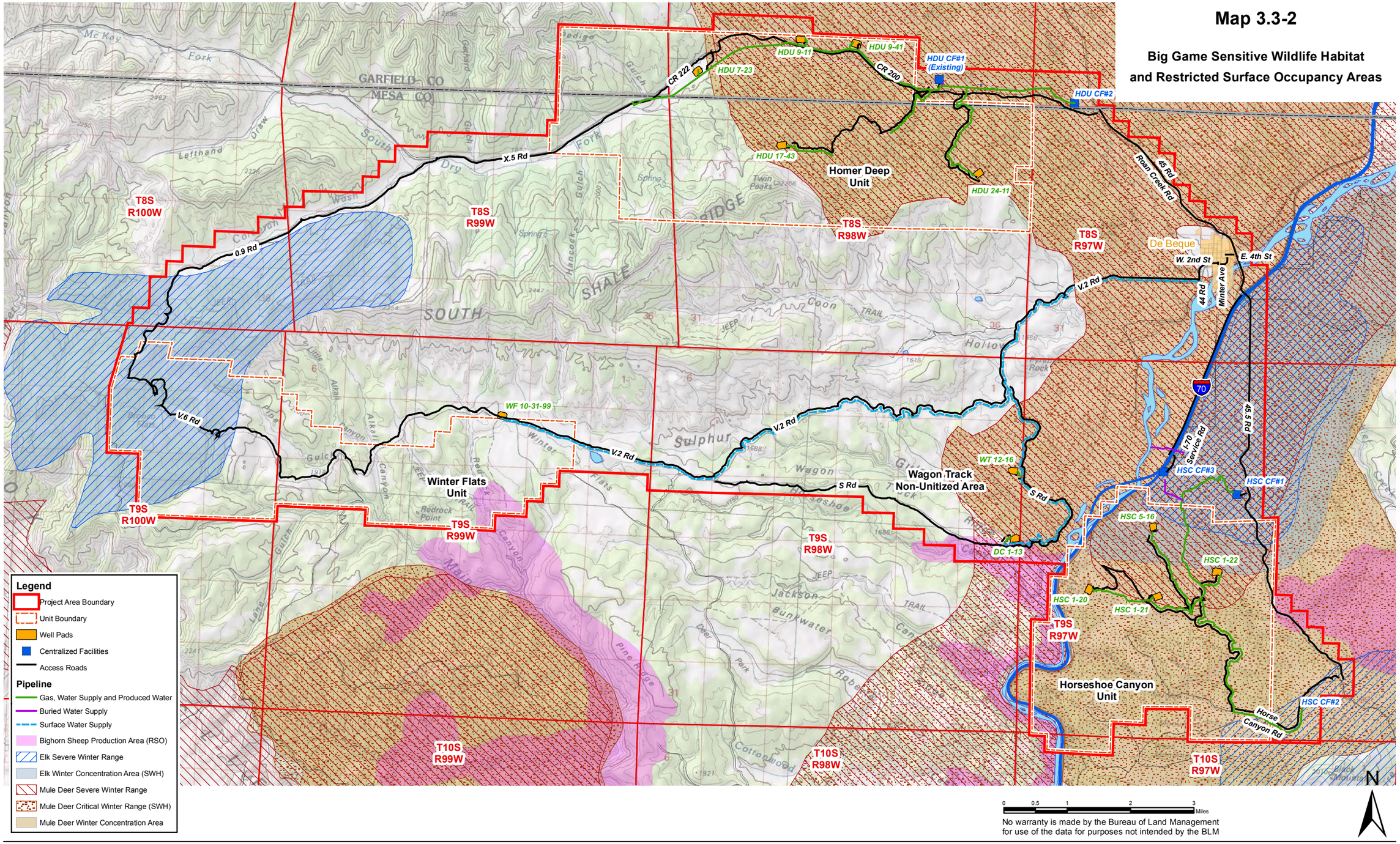
Elk and mule deer are likely to be present on winter ranges from the first heavy snowfall (November or December) to spring green-up (CPW, 2011b), usually April to May. In addition, CPW (2012d) has defined mule deer critical winter range as parts of the winter range that are of highest priority for protection from disturbance and which are critical to sustain mule deer populations. Critical winter ranges are generally combinations of winter concentration area and severe winter ranges.

All of the project area coincides with mule deer winter range used by animals in the two populations. Deer use of the project area during severe winter conditions occurs in the eastern half of the Homer Deep, Wagon Track, and northern Horseshoe Canyon areas, where CPW (2012d) has delineated mule deer critical winter range that include both mule deer severe winter range and winter concentration areas (see Map 3.3-2). Elk in the E-14 population winter in the western half of the Winter Flats area; elk in population E-10 winter within the northern and southern portions of the Horseshoe Canyon area where CPW (2012d) has delineated elk winter concentration areas and elk severe winter range (see Map 3.3-2). Elk Winter Concentration Areas and Mule Deer Critical Winter Ranges are classified SWH (Sensitive Wildlife Habitats) under Colorado Oil and Gas Conservation Commission Rule 1200 (COGCC, 2009). Rule 1200 requires operators of proposed new oil and gas locations that are within SWH to consult with CPW, the surface owner and the COGCC Director to identify possible Conditions of Approval (see sections 1202(a), (b) and (c), with exceptions in sections 1202(d) and (e)).

Densities of wintering big game within the project area vary by big game species, population and winter range type. Estimates of densities in Table 3.3-17 are based on CPW (2012d) definitions of animal distributions (above), total mapped winter range types within a population area and the number of animals in the population during the current year. For any species and population in the project area, expected animal densities would be highest on severe winter range, intermediate on winter concentration areas and lowest on winter range. Alternatively, the amount of winter range that is available for each wintering animal in the project area is least for severe winter range and greatest for winter range (see Table 3.3-17).

## Map 3.3-2

**Big Game Sensitive Wildlife Habitat and Restricted Surface Occupancy Areas**




No warranty is made by the Bureau of Land Management for use of the data for purposes not intended by the BLM

**Table 3.3-17**
**Expected Big Game Densities on Existing Winter Range Types within the Project Area**

| Big Game Population | 2011 Population | Big Game Winter Range Type | Total Area (acres) of Winter Range for Population | Estimated Animal Density (animals/acre) on Winter Range | Area (acres) Available for Each Animal |
|---|---|---|---|---|---|
| Mule Deer D-41 | 8,120 deer | Winter Range | 289,305 | 0.0253 | 39.6 |
| | | Winter Concentration | 107,629 | 0.0435 | 23.0 |
| | | Severe Winter Range | 139,454 | 0.0524 | 19.1 |
| Mule Deer D-12 | 19,210 deer | Winter Range | 350,917 | 0.0493 | 20.3 |
| | | Winter Concentration | 146.649 | 0.1594 | 12.4 |
| | | Severe Winter Range | 108,457 | 0.0805 | 6.3 |
| Elk E-10 | 11,980 elk | Winter Range | 1,541,033 | 0.0070 | 142.9 |
| | | Winter Concentration | 341,430 | 0.0145 | 68.8 |
| | | Severe Winter Range | 89.038 | 0.1211 | 8.3 |
| Elk E-14 | 17,610 elk | Winter Range | 786,841 | 0.0201 | 49.6 |
| | | Winter Concentration | 213,233 | 0.0391 | 25.6 |
| | | Severe Winter Range | 179,335 | 0.0884 | 11.3 |

[1] Within the project area, mule deer winter concentration areas and severe winter range are included entirely within critical winter range SWH shown in Map 3.3-2. Elk winter concentration area (SWH) does not occur in the southern portion of the Horseshoe Canyon Unit where only elk severe winter range has been delineated by CPW (2012d); see Map 3.3-2.

Rocky Mountain bighorn sheep are present in both GMUs. The Battlement Mesa bighorn sheep population (BS-34) may occupy overall range across the project area on both sides of the Colorado River. There is no harvest of bighorns within BS-34. The population has grown from 20 animals in 2003 to about 50 in 2011. Bighorn sheep production range coincides with 45 acres at the south edge of the Wagon Track area and with 6.8 acres adjacent to the DeBeque Cutoff road along the east edge of the Horseshoe Canyon area (see Map 3.3-2). Rocky Mountain bighorn sheep production areas are portions of the overall range occupied by pregnant females from May 1 to June 30. Bighorn sheep production areas are classified as Restricted Surface Occupancy (RSO) areas under COGCC Rule 1200 (COGCC, 2009).

The project area coincides with habitats utilized by black bears year-round (black bear overall range) but 5,137 acres in Winter Flats and 1,743 acres in Homer Deep have been identified as black bear fall concentration habitat, used by bears from August 15 through the end of September to build fat reserves as they feed on mast (e.g., acorns) and berries prior to hibernation. Multiple instances of conflicts with black bears have occurred within De Beque and on agricultural and residential lands south of Roan Creek. Four black bears, on average, have been harvested in GMU 31 and 21 have been harvested in GMU 42 since 2002 (CPW, 2012b).

The entire project area coincides with mountain lion overall range. On average, six mountain lions have been harvested annually in GMU 31 and seven have been harvested in GMU 42 since 2002 (CPW, 2012c). There are no areas of mountain lion conflicts with humans noted in the project area or vicinity.

**Small Game/Upland Game.** Small game includes a variety of mammal and bird species. Harvest is compiled by county rather than by GMU. During the 2010/2011 harvest year, eight small game species were harvested in Mesa and Garfield counties; only four of the species are likely to occur in the project area: cottontails (desert cottontail and mountain cottontail), coyote, Gambel's quail and mourning dove. Small game species including coyote, desert cottontail rabbit and black-tailed jackrabbit were observed during on-site surveys in 2012 (WestWater Engineering, 2012a, 2012b, 2012c and 2012d).

Most of Homer Deep and Winter Flats is used by wild turkeys. Turkeys are generally associated with stands of Gambel oak shrublands, pinyon-juniper woodlands and riparian forests. Wild turkey winter range have been mapped (CPW, 2011b) in upper Winter Flats and western Homer

Deep. During spring 2011, 122 turkeys were harvested in Mesa County and 104 were harvested in Garfield County. Suitable habitat for most waterfowl is limited to the Colorado River and several small impoundments in the project area. CPW (2011b) has defined snow goose production areas and snow goose winter ranges (used by geese winter loafing, resting and foraging) along the Colorado River.

**Non-game Wildlife**. Based on habitats present and the distribution of non-game species within Mesa and Garfield counties (not counting various game species discussed above and the sensitive species), four species of amphibians, 14 species of reptiles, 149 species of birds and 33 species of non-game mammals could occupy habitats within the project area and vicinity. Hopi chipmunk, rock squirrel, golden mantled ground squirrel, plateau striped whiptail, plateau lizard, western whiptail, collared lizard, short-horned lizard, tree lizard and side-blotched lizard were observed on-site in 2012 (WestWater Engineering, 2012a, 2012b, 2012c and 2012d).

Within the project area and vicinity, most non-game species are likely to occur within forest-dominated wetland and/or riparian habitats. The least number of species is expected to be associated with Developed lands, which equate to existing well pads, dirt or gravel roads and other disturbed ground surfaces in the project area.

**Fish and Other Aquatic Species**. Dry Fork is a permanently flowing waterbody within the Homer Deep Unit and South Dry Fork may have year-round flows in some years. No permanent water bodies occur in the Winter Flats or Wagon Track portions of the project area. The Colorado River flows through the Horseshoe Canyon Unit. Native fish species sampled in the Colorado River at Cameo, downstream from Roan Creek (Deacon and Mize, 1997), include mountain whitefish, mottled sculpin, white sucker, bluehead sucker, flannelmouth sucker, roundtail chub, speckled dace and four introduced species: common carp, green sunfish, largemouth bass and brown trout. The native fish species that potentially occur in the project area spawn during spring (Woodling, 1985) when flows in the creeks are highest.

Brook trout and rainbow trout are present in Roan Creek, which Garfield CR 200 crosses to access to the Homer Deep area. Brook trout and rainbow trout were introduced in the 1880s (Woodling, 1985). Dry Fork was sampled for fish during 1996 but none were present, probably due to high concentrations of dissolved solids and low stream flow (Deacon and Mize, 1997).

The roundtail chub, bluehead sucker and flannelmouth sucker might occur in lower portions of Roan Creek given their presence in Colorado River. All three species are declining throughout their ranges and are the focus of a multi-state conservation strategy to minimize threats to the species and habitats (Karpowitz, 2006).

**Public Land Health Standard 3 (Terrestrial Wildlife)**

Standard 3 - Healthy, productive plant and animal communities of native and other desirable species are maintained at viable population levels commensurate with the species and habitat's potential. Plants and animals at both the community and population level are productive, resilient, diverse, vigorous and able to reproduce and sustain natural fluctuations and ecological processes.

Land Health Assessments for the DeBeque/Roan Creek landscape area were evaluated in 2004 and 2006 (BLM, 2009a). Approximately 17 percent of the area evaluated was not meeting Standard 3, primarily due to invasive cheatgrass and low abundance of perennial plant species. Poorly revegetated surfaces disturbed by oil and gas activities contributed to not meeting the standard. The evaluation concluded that wildlife habitat was degraded and should be improved through protections of soils, restoration of native vegetation and prevention of further weed infestations (BLM, 2009a, Table 3-1).

The BLM recently conducted a Public Land Health Assessment on the Big Park grazing allotment that coincides with the Horseshoe Canyon area. The allotment provides winter habitat for big game and grazing is slight within most range sites with the exception of a burned area that has attracted use by both wild and domestic animals. Approximately half of the range sites in the assessment area are meeting Public Land Health Standard 3. Sites not meeting Standard 3 may not provide adequate wildlife habitat because suitable native vegetation and functional structural groups are not present.

#### 3.3.7.2 Environmental Consequences

**Proposed Action Alternative**

**Terrestrial Species and Habitats.** Construction of the Proposed Action could directly and/or indirectly affect terrestrial wildlife present in the project area through one or more of the following pathways:

- Direct mortality by construction vehicles and vehicles accessing the project area during construction and operation of the project and poaching coincidental with increased human use.
- Removal and alteration of vegetation composition and structure of existing habitats, making them less functional for wildlife.
- Decreased habitat use proximate to the project components (within a zone of effect) caused by displacement of animals to alternative habitats.
- Direct and indirect effects to population carrying capacities.

Direct Mortality. Increased project-related traffic could result in wildlife mortalities, especially for mammals and reptiles. Species most susceptible to vehicle-related mortality include those that are inconspicuous (lizards, snakes and small mammals), those with limited mobility, burrowing species (mice and voles), wildlife with behavioral activity patterns (i.e., nocturnal activity) making them vulnerable and wildlife that may scavenge roadside carrion (Leedy, 1975, Bennett, 1991, Forman and Alexander, 1998). For example, wildlife-vehicle collisions documented for mule deer indicate that mortality increases with traffic volume during winter and other seasons (Arnold, 1978; Romin and Bissonette, 1996). Observing speed limits (Biological Resources Protection Plan), taking precaution where wildlife crossing signs are placed along roads and limiting most construction traffic to within 3 hours of sunrise and sunset (between 10 a.m. and 3 p.m.) between December 1 and May 1 and to daylight hours for the remainder of the year to avoid peak wildlife activity times, would reduce the potential for vehicle collisions with terrestrial wildlife.

Wildlife access to highly saline water in reserve pits could occur, potentially causing salt toxicosis as described for BLM Sensitive Species in Section 3.3.4.2. As required by the BLM GJFO Standard COAs, Black Hills would fence all four sides of the pit as soon as the pit is constructed.

Poaching wildlife is a possible consequence of additional human access within wildlife habitats (Comer, 1982). Black Hills would provide environmental awareness training to all employees to address consequences of poaching and provide information about federal and state wildlife laws (Biological Resources Protection Plan). Black Hills would also scatter vegetative material cleared and shredded back across pipeline construction disturbances to increase surface roughness and deter off-road vehicle use.

Habitat Loss and Alteration. Construction would remove habitats used by big game, upland and small game and non-game wildlife species. The Proposed Action would affect 287.69 acres of potentially suitable habitats for wildlife species within the project area habitat (woodlands, shrublands–disturbed, grasslands, exposed rock and unaltered, forested and non-forested

wetland/riparian habitat (see Table 3.3-2). Non-game wildlife species would potentially be displaced from habitats cleared of vegetation, but could be a short-term effect.

Noxious weeds can interfere with reestablishment of native vegetation species (Section 3.3.2, Vegetation) and many weeds are unpalatable to wildlife (Whitson et al., 1996). Successful restoration of vegetated seasonal ranges would provide more suitable habitat, especially on previously disturbed lands and could reduce deer and elk densities on unaffected ranges.

Construction would require removal of 299.94 acres of mule deer winter range, including 270.56 acres of winter concentration area, 216.81 acres of severe winter range and 271.37 acres of critical winter range (designated by CPW), all of which partially overlap. The project would also remove 134.94 acres of elk winter range, including 50.85 acres of elk winter concentration area and 39.19 acres of severe winter range that partially overlap. In addition, the project would affect approximately 254.15 acres of bighorn sheep overall range, of which 0.52 acre has been delineated as bighorn sheep production area. These estimates are based on the analysis of 10 acre well pads. As proposed, no more than 6.8 acres would be disturbed per well pad.

The Proposed Action would affect big game SWH and RSO areas (see Map 3.3-2) subject to COGCC Rule 1200 (COGCC, 2009). Big game SWH affected by the Proposed Action (see Table 3.3-18) includes a total of 271.37 acres in mule deer critical winter range and elk winter concentration area which overlap in the Horseshoe Canyon area (based on 10 acre well pad disturbances). The Proposed Action would require use of Mesa County S Road for 0.47 mile within a bighorn sheep production area (RSO area) to access well pad DC 1-13 in the Wagon Track area. A temporary surface water pipeline would be placed adjacent to Mesa County S Road. Approximately 0.37 acre of the new well pad would be within the bighorn sheep production area (RSO area). Black Hills and CDOW (now Colorado Parks and Wildlife - CPW) prepared and signed a Wildlife Mitigation Plan in 2010 and are currently preparing a revised mitigation plan. The BLM has not been involved in these discussions, any mitigation included in this plan when finalized may be considered by the BLM if determined by the BLM to be appropriate and relevant to this project

**Table 3.3-18**
**Proposed Surface Disturbances within Sensitive**
**Big Game Winter Habitats (SWH) and Restricted Surface Occupancy (RSO) Areas[1]**

| Exploration Area/ Sensitive Wildlife Habitat | Area (acres) Affected by Project Component | | | | | |
|---|---|---|---|---|---|---|
| | Well Pads | Centralized Facilities | Pipeline | Road | Road/ Pipeline | Total |
| **Homer Deep:** | | | | | | |
| Mule Deer Critical Winter Range (SWH) | 39.36 | 12.81 | 38.14 | 1.27 | 24.23 | 115.81 |
| **Winter Flats:** | | | | | | |
| None | 0 | 0 | 0 | 0 | 0 | 0 |
| **Wagon Track** | | | | | | |
| Mule Deer Critical Winter Range (SWH) | 18.48 | | | 0.62 | 1.52 | 20.62 |
| Bighorn Sheep Production Area (RSO) | 0.37 | | 0.15 | | | 0.52 |
| **Horseshoe Canyon** | | | | | | |
| Mule Deer Critical Winter Range/Elk Winter Concentration Area (SWH) | 36.20 | 25.69 | 22.91 | 6.49 | 43.65 | 134.94 |
| **Total** | **94.41** | **38.50** | **61.20** | **8.38** | **69.40** | **271.89** |

[1] Based on 10 acre well pad disturbance, well pad disturbance under the Proposed Action would not exceed 6.8 acres.

Surface disturbances by pipeline construction would be reclaimed at the time of installation which could reduce some of the long-term impact to big game SWH (Table 3.3-18).

Animal Displacement. For well pads HDU 7-23 and DC 1-13, big game lease stipulations would require a timing limitation on construction and drilling from December 1 to April 30. For

proposed well pads located in SWH (severe winter range and winter concentration areas) that do not have lease stipulations, the BLM would impose a 60 day timing limitation (January 1 to March 1). Winter conditions could extend from November to May and proposed well pad construction, well drilling, completions and associated traffic would occur during some portion of the winter season. Project construction and operation are expected to affect mule deer and elk distributions on winter ranges to some distance away from project components. Mule deer generally avoid roads (Rost and Bailey, 1979; Easterly et al., 1991). Elk also avoid roads and traffic (Rost and Bailey, 1979: Lyon, 1983; Rowland et al., 2000). A 5 month timing limitation is desirable and indicated from a resource perspective for all activities in big game SWH, but BLM cannot require it.

In one natural gas well field in Wyoming, mule deer avoided roads with high traffic volumes (263 to 350 vehicles/day) by an average distance of 4 miles during winter/year round drilling and production. Mule deer avoided roads with moderate traffic volumes (19 to 30 vehicles/day) by an average of 1 mile but their avoidance of roads with low volumes (up to 12 vehicles/day) averaged 0.5 mile (Sawyer et al., 2006). Wintering elk also are affected by roads and were found to reduce their use of habitats by distances of up to 0.75 mile from roads, less than their avoidance of roads during summer which was up to 1.7 miles from roads. Greater avoidance of roads by summering elk may be due to higher traffic volume and recreational use in summer than in winter (Sawyer et al., 2007).

In areas where the winter timing limitation could only be required from January 1 to March 1, a greater incidence of mortality to deer and elk would be likely, due to additional stress and energy expense, particularly in years when winter conditions are severe. Increased vehicular access could also induce glucocorticoid stress in wintering animals (Creel et al., 2002; Sheriff et al., 2011), especially during periods of winter when no timing limitations are imposed by lease stipulations. Chronic stress can lead to increased mortality, especially of juveniles, during months with snow accumulations. The energy animals must expend to escape vehicles (Hobbs, 1989) increases when they are moving through accumulated snow (Parker et al., 1984).

Mule deer avoidance of natural gas well pads may differ during the winter, depending on forage needs and levels of activity occurring at the pads (Sawyer et al., 2006; Sawyer et al., 2007; and Sawyer et al., 2009). High levels of habitat use by wintering mule deer may be expected 1.6 miles away from a well pad subject to traffic volumes of 2 to 5 vehicle passes per day during winter (Saywer et al., 2009). Traffic volumes from 4 to 9 vehicles per day at well pads resulted in high use of wintering habitats by mule deer 2.7 miles away. High use of habitats by wintering mule deer could be expected 4.7 miles away from winter drilling with traffic passes from 86 to 145 vehicles per day (Sawyer et al., 2009). The study results indicated a variable “zone of effect” beyond the actual physical disturbance of mule deer winter habitats that included under-utilized areas that consequently were less functional as winter range.

For the Proposed Action, peak construction traffic to construct a well pad and mobilize one drill rig and one completion rig is estimated at 88 vehicle round trips per day (Transportation Plan). Based on observations of mule deer distributions during winter on natural gas fields in Wyoming (Sawyer et al., 2006 and 2009), mule deer may avoid roads in the project area by 1 to 4 miles during winter. In addition, high mule deer use of winter habitats surrounding well pads might be expected from 2.7 to 4.7 miles away but habitats closer to well pads would be utilized at lower levels and be less functional as mule deer wintering habitat. Because of differences in topography, winter conditions, existing traffic levels and previous levels of exposure to human presence, mule deer wintering within the project area are not expected to behave exactly as the mule deer in the Sawyer et al. (2006 and 2009) studies. However, during winter months, indirect effects to wintering deer would result from the Proposed Action.

Traffic volumes would be reduced during production with an estimated three vehicle trips per day at centralized facilities (Transportation Plan). Remote telemetry (Biological Resources Protection Plan) would be used for all well locations during production, which could limit vehicle visits to each pad. During production, produced water unsuitable for recycling would be disposed of at the Black Hills Hancock Gulch #1 injection well, located in the Homer Deep Unit. Access to the Hancock Gulch #1 injection well would be through mule deer critical ranges on Garfield County roads 200 and 222. The daily traffic volume trucking produced water to the injection well could be five round trips per day or more (one truck from each centralized facility and trucks from wells in Winter Flats and Wagon Track areas). The production phase is expected to last 20 years. At that volume, mule deer could be expected to avoid roads by up to 0.5 mile (see discussion, above).

Effects to Carrying Capacity. Expected densities of mule deer and elk on winter ranges during different winter conditions (see Table 3.3-17) would likely be less close to proposed project components and greater farther away. Direct removal of vegetated habitats by construction could indirectly affect big game by causing displacement, with increased densities of animals on habitats away from the proposed project. Increased densities could lead to density-dependent effects including overcrowding and overutilization of remaining habitats, increased intraspecific competition and increased prevalence of disease, predation and physiological stress.

Studies in western Colorado have shown that malnutrition in mule deer fawns plays a major role in their over-winter survival rates and nutritional status of pregnant females on winter ranges affects survival of fawns (Watkins et al. 2007). Malnutrition is a major consequence of overcrowding, habitat degradation and reduced habitat function, leading to density-dependent population declines that have become widespread across the Colorado Plateau (Watkins et al., 2007).

Mule deer population declines have been associated with direct habitat loss and indirect habitat losses (due to zones of effect) on oil and gas developments within winter ranges in Wyoming (Sawyer and Nielson, 2011). Direct and indirect habitat losses by the Proposed Action would be less than those caused by intense wellfield development in Wyoming.

CPW recommended that densities of wellfield facilities in the project area that exceed one well pad per square mile should be avoided on mule deer and elk winter ranges (CDOW, 2009). Wyoming Game and Fish Department - WGFD (2010) determined that well pad densities of one to four pads per square mile on mule deer and elk crucial winter ranges would be classified as moderate to high levels of impact. Moderate and high impacts impair habitat function and require seasonal use restrictions, implementation of BMPs and possibly implementation of on-site and off-site habitat mitigation and enhancement practices. According to WGFD, four well pads per square mile would result in impaired habitat function within 160 acres of each pad, extending to a distance of 1,490 feet away. Using that distance as an example of a zone of effect, the Proposed Action would directly impact 270.56 acres of mule deer winter concentration area. Habitat function would also be impaired in another 6,681 acres of winter concentration areas. For mule deer severe winter range, 216.81 acres would be directly impacted while 4,897 acres would be indirectly impacted. Similar levels of direct and indirect impacts would occur on elk winter concentration areas and severe winter ranges. Estimates are based on 10 acre well pads, but since the Proposed Action would limit pad disturbances to 6.8 acres, effects might be somewhat lessened.

Numerous BMPs would reduce project effects to wintering mule deer, elk and other wildlife species (Biological Resource Protection Plan – Appendix E).

**Aquatic Species and Habitats.** Construction of the Proposed Action could directly and/or indirectly affect aquatic species and habitats present in the project area through some of the

same pathways that might affect endangered Colorado River fish species. In particular, the project could cause, 1) decreased water quality from mobilized selenium in the Colorado River and tributaries, 2) potential impingement and entrainment in pump intakes of larval or juvenile aquatic species and 3) accidental release of hazardous materials (diesel fuel, lubricants and herbicides) in area aquatic habitats and with potential effects downstream in the Colorado River. Several aquatic wildlife protection measures are included in the Biological Resources Protection Plan (Appendix E), but impacts to fish and amphibians could occur in isolated work areas required for dry open-cut pipeline construction across drainages when water is present.

**Protective/Mitigation Measures**

The proposal includes multiple measures to minimize impacts to wildlife.

- See Biological Resources Protection Plan (Appendix E) for details.

The following BLM GJFO Standard COAs would be required, to minimize impacts to wildlife:

- Operator and all subcontractors will comply with all State wildlife laws. As per Colorado Revised Statute 33-6-109 (1), it is unlawful for anyone to hunt, take or possess wildlife except as permitted by Colorado Statute or by Colorado Wildlife Commission regulation. Colorado statute defines “hunt” to include “trapping” and “capturing.” The trapping and subsequent drowning of wildlife within a pit may be viewed as illegal taking of wildlife and criminal or civil actions/penalties for wildlife could be imposed. “Wildlife friendly” conditions are intended to prevent wildlife loss and potential legal consequences.
- Where winter range areas identified by BLM are not protected by lease stipulations, an annual Timing Limitation (TL) period will apply from January 1 to March 1, to minimize impacts to wintering big game. All construction, drilling, completion, work-overs and other intensive activities are excluded during the 60-day period. Requests for exceptions to Timing Limitations will be submitted in writing to the BLM via a Sundry Notice.

In addition to the protective measures described above, the BLM would require the following additional protective/mitigation measures to further reduce potential impacts to wildlife:

- All equipment used within drainages should be sanitized appropriately per CPW protocols including water extraction equipment that may be utilized in one waterway and transferred to another waterway.
- Stream crossings (both ephemeral and perennial) should not impede aquatic wildlife migration.
- Any roads and/or pipelines constructed in drainages should not impede migration of aquatic wildlife.
- The box culvert or bridge proposed for well pad HDU 7-23 should be designed to cross South Dry Fork such that it does not impede migration of aquatic wildlife.
- Black Hills should require all personnel working on-site to review the CPW publication “Living with Bears” (Available online: http://wildlife.state.co.us/WildlifeSpecies/LivingWithWildlife/Mammals/Pages/LivingWithBears.aspx), developed as part of the Bear Aware program.
- Reporting of poaching incidents to Operation Game Thief should be encouraged.
- Because dry open-cut construction requires isolating the workspace between the temporary dam upstream and downstream, fish and amphibians should be captured, removed from the isolated workspace by seining and/or use of electroshock and placed downstream.

- Workers should carpool to drilling locations during winter months (December through April).

**No Action Alternative**

Under this alternative, no project-related impacts to wildlife species on BLM-administered lands would occur from construction and operation of the Proposed Action.

**Finding on the Public Land Health Standard 3 (Terrestrial Wildlife)**

The Proposed Action has the potential to further contribute to degradation of the DeBeque/Roan Creek landscape and its failure to meet Land Health Standard 3, since new surface disturbances are potential areas for invasion by noxious weeds, including cheatgrass. The Proposed Action might not further degrade plant communities in the Assessment area with adherence to the BLM's Noxious and Invasive Weed Management Plan for Oil and Gas Operators (BLM, 2007a).

Although the Proposed Action would affect terrestrial wildlife habitat, noxious weed management and successful reclamation of construction disturbance could help minimize the effects of the Proposed Action.

Under the No Action Alternative, effects from existing and new surface disturbances (unrelated to the Proposed Action) would continue and could affect Public Land Health Standard 3.

## 3.4 HERITAGE RESOURCES AND HUMAN ENVIRONMENT

### 3.4.1 Cultural Resources

#### 3.4.1.1 Current Conditions

The BLM manages cultural resources on public lands in accordance with the Antiquities Act of 1906, National Historic Preservation Act (NHPA) of 1966, Native American Graves Protection and Repatriation Act of 1990, the Archaeological Resources Protection Act (ARPA) of 1979 and various other laws and Executive Orders. The management process is also governed by the Colorado BLM's Protocol with the State Historic Preservation Officer (SHPO), implementing the BLM's National Programmatic Agreement with the Advisory Council on Historic Preservation. Section 106 of NHPA applies to consideration of the presence of and effect to cultural resources on both public and private lands in the area of potential effect (APE).

Grand River Institute (GRI) conducted a file search and literature reviews through the BLM GJFO and the Colorado Historical Society Office of Archaeology and Historic Preservation. These searches provide an overview of the existing known cultural resources in the vicinity of the APE. A total of 49 prehistoric and historic sites were located in the area of study (Table 3.4-1).

In the greater region encompassing the project area, cultural resources span about 12,000 years and represent use of Paleoindian, Archaic, Formative, Protohistoric and historic populations. The region contains prehistoric and historic sites and traditional cultural places. Examples of known cultural resources in the project area include but are not limited to lithic scatters, rock art, camps, hunting sites, trails, wagon roads and ditches.

**Table 3.4-1**
**Previously Recorded Sites Located within the APE**

| Site Number | Site Type | Previous NRHP Eligibility |
|---|---|---|
| 5ME.692 | Unknown Prehistoric | No Assessment |
| 5ME.693 | Open Camp | Needs Data - Field |
| 5ME.924.2 | Roan Creek Toll Road | Eligible-Supporting |
| 5ME.1216 | Historic Habitation/Trash Dump | Needs Data - Field |
| 5ME.1298 | Open Camp | Eligible – Field |
| 5ME.1385 | Isolated Feature | Not Eligible - Field |
| 5ME.1550 | Rock Art | Eligible - Officially |
| 5ME.3673 | Open Lithic | Not Eligible - Field |
| 5ME.3674 | Open Lithic | Needs Data - Field |
| 5ME.3679 | Open Camp | Needs Data - Field |
| 5ME.3680 | Open Camp | Needs Data - Field |
| 5ME.3684 | Open Lithic | Needs Data - Field |
| 5ME.3686 | Open Camp | Eligible – Field |
| 5ME.3687 | Sheltered Camp | Eligible - Officially |
| 5ME.3689 | Open Lithic | Not Eligible - Officially |
| 5ME.3690 | Open Lithic/Trash Dump | Needs Data - Field |
| 5ME.3696 | Open Lithic/Quarry | Not Eligible - Officially |
| 5ME.3698 | Open Lithic | Not Eligible - Officially |
| 5ME.3700 | Quarry/Open Lithic | Needs Data - Field |
| 5ME.3701 | Open Lithic | Needs Data - Field |
| 5ME.3723 | Open Lithic | Needs Data - Field |
| 5ME.3726 | Open Lithic | Needs Data - Field |
| 5ME.3731/5ME.6939 | Sheltered Camp/Rock Art | Eligible – Field |
| 5ME.3837 | Open Camp | Not Eligible - Officially |
| 5ME.3840 | Open Lithic | Not Eligible - Field |
| 5ME.3845 | Open Camp | Not Eligible - Officially |
| 5ME.4423 | Isolated Feature | Not eligible - Field |
| 5ME.4424 | Open Camp | Needs Data - Field |
| 5ME.6445 | Open Architectural | Eligible - Officially |
| 5ME.6951 | Open Camp | Needs Data - Officially |
| 5ME.6955 | Open Lithic | Not Eligible - Officially |
| 5ME.6960 | Open Lithic | Needs Data - Officially |
| 5ME.7089 | Sheltered Camp | Eligible - Officially |
| 5ME.7121 | Open Camp | Needs Data- Officially |
| 5ME.11639 | Open Camp | Not Eligible - Officially |
| 5ME.11859 | Bluestone Valley Ditch | Needs Data - Officially |
| 5ME.11907 | Larkin Ditch | Eligible - Officially |
| 5ME.12147 | Open Camp | Needs Data - Field |

| Site Number | Site Type | Previous NRHP Eligibility |
|---|---|---|
| 5ME.15463.1 | Historic Road (Horse Canyon Road) | Not Eligible - Officially |
| 5ME.15718 | Open Lithic | Not Eligible - Officially |
| 5ME.15719 | Open Camp | Not Eligible - Officially |
| 5ME.15724 | Open Lithic | Not Eligible - Officially |
| 5ME.16409 | Open Lithic | Not Eligible - Officially |
| 5ME.16411 | Open Lithic | Not Eligible - Officially |
| 5ME.16466 | Open Lithic | Not Eligible - Officially |
| 5ME.17717 | Camp | Not Eligible - Officially |
| 5ME.18281 | Sheltered Camp | Eligible - Field |
| 5ME.18283 | Historic Open Camp | Eligible - Field |
| 5ME.18439 | Historic Trash Scatter | Not Eligible - Field |

GRI also recently completed an intensive Class III cultural resource inventory in the APE of the Proposed Action, as defined in the NHPA (Conner et al., 2012). During the inventory, the previously recorded sites described above were revisited to either confirm the original recordings and their evaluations, or to reevaluate them. For well pads and centralized facilities, 40-acre blocks were surveyed. For linear routes (roads/pipelines) 200-foot-wide corridors were surveyed. Where pipelines and pads/facilities moved outside or adjacent to the edges of the surveyed areas, researchers extended the survey area (100 feet for pipelines and re-centered 40 acre blocks). Block areas and linear routes were inventoried by crews of two to four people with transects spaced at about 48 feet.

This inventory provided an opportunity to continue the archaeological investigations on the benchland areas along the Colorado River. As expected, prehistoric open camps and historic linear features were two of the most prevalent site types encountered. Previous archaeological studies in the general vicinity have suggested regional occupation for as long as 8,000 years. Recently, an inventory of block units east the study area provides direct evidence of the presence of Foothill-Mountain Paleoindian occupation at 5GF.I323, pushing the regional prehistoric occupation dates back to about 10,000 years ago.

Overall, the inventory consisted of 13 proposed well pads, five centralized facilities (844 acres) and about 47 miles of linear routes (1,146 acres) for a total of 1,990 acres. Of that, about 341 acres (86 block acres and 255 linear acres) in the project area were not surveyed due to private land access denial, or because they were recently previously surveyed. Areas surveyed by GRI in 2012 included 757 block acres and about 892 linear acres, totaling 1,649 acres (1083 BLM, 566 Private). GRI reevaluated the 49 previously recorded sites and recorded 32 new sites and 50 isolated finds. Table 3.4-2 summarizes the revisited and newly recorded sites in the APE. It provides field-evaluated recommendation for National Register of Historic Places (NRHP) eligibility and landowner status. Isolated finds are not eligible for listing on the NRHP and are not discussed in this EA. Recommendations for eligibility are pertinent in guiding the final determination of site significance.

**Table 3.4-2**
**Revisited and Newly Recorded Sites in the Proposed Action APE**

| Site number | Site type | Eligibility | Landowner |
|---|---|---|---|
| 5GF.4758.1 | Historic Road (Dry Fork) | Eligible - non-supporting | BLM |
| 5GF.4758.2 | Historic Road (Dry Fork) | Eligible - non-supporting | BLM |
| 5GF.4759 | Open Architectural | Eligible | BLM |
| 5GF.4760 | Open Camp | Not eligible | Private |
| 5GF.4761 | Open Camp | Not eligible | BLM |
| 5GF.4762 | Open Camp | Eligible | BLM |
| 5GF.4765 | Open Camp | Eligible | Private |
| 5ME.692** | Unknown, Prehistoric | No Assessment | BLM |
| 5ME.693 | Open Camp | Not Eligible | BLM |
| 5ME.924.7 | Historic Trail (Roan Creek Toll) | Eligible - non-supporting | Private/BLM |
| 5ME.1216 | Historic Habitation | Not eligible | Private |
| 5ME.1298 | Open Camp | Eligible | Private |
| 5ME.1385 | Isolated Feature | Not Eligible | BLM |
| 5ME.1550 | Rock Art | Eligible | BLM |
| 5ME.3673 | Open Lithic | Not Eligible | Private/BLM |
| 5ME.3674 | Open Lithic | Not Eligible | Private |
| 5ME.3679 | Open Camp | Eligible | Private |
| 5ME.3680 | Open Camp | Eligible | Private |
| 5ME.3684 | Open Lithic | Not Eligible | Private |
| 5ME.3686 | Open Camp | Needs Data | BLM |
| 5ME.3687 | Sheltered Camp | Eligible | BLM |
| 5ME.3689 | Open Lithic | Not Eligible | BLM |
| 5ME.3690 | Open Lithic | Not Eligible | BLM |
| 5ME.3696** | Open Lithic/Quarry | No Assessment | BLM |
| 5ME.3698 | Open Lithic | Not Eligible | BLM |
| 5ME.3700** | Open Lithic | No Assessment | Private |
| 5ME.3701 | Open Lithic | Not Eligible | Private |
| 5ME.3723 | Open Lithic | Not Eligible | Private |
| 5ME.3726 | Open Camp | Eligible | Private |
| 5ME.3731 | Sheltered Camp/Rock Art | Eligible | BLM |
| 5ME.3837 | Sheltered Camp | Eligible | BLM |
| 5ME.3839 | Open Lithic | Not Eligible | BLM |

| Site number | Site type | Eligibility | Landowner |
|---|---|---|---|
| 5ME.3845 | Open Camp | Eligible | BLM |
| 5ME.4423 | Isolated feature | Not Eligible | BLM |
| 5ME.4424 | Open Camp | Not Eligible | BLM |
| 5ME.6445 | Open Camp | Eligible | Private/BLM |
| 5ME.6939 | Incorporated into 5ME.3731 | Not Eligible | BLM |
| 5ME.6951 | Open Camp | Not Eligible | BLM |
| 5ME.6955 | Open Lithic/Procurement | Not Eligible | Private |
| 5ME.6960 | Open Lithic | Not Eligible | BLM |
| 5ME.7089 | Sheltered Camp | Eligible | BLM |
| 5ME.7121 | Open Camp | Eligible | BLM |
| 5ME.11639 | Open Camp | Not Eligible | BLM |
| 5ME.11859.3 | Historic Ditch (Bluestone Valley) | Eligible - non-supporting | Private |
| 5ME.11907.3 | Historic Ditch (Larkin) | Eligible - supporting | Private |
| 5ME.12147 | Open Camp | Needs Data | BLM |
| 5ME.15463.1 | Historic Road (Horse Canyon) | Not Eligible | Private/BLM |
| 5ME.15718 | Open Lithic | Not Eligible | BLM |
| 5ME.15719 | Open camp | Not Eligible | BLM |
| 5ME.15724 | Open Lithic | Not Eligible | BLM |
| 5ME.16409 | Open Lithic/Quarry | Not Eligible | BLM |
| 5ME.16411 | Open Lithic | Not Eligible | BLM |
| 5ME.16466 | Open Lithic/Quarry | Not Eligible | Private/BLM |
| 5ME.17717 | Historic Trash Scatter | Not Eligible | BLM |
| 5ME.18281 | Sheltered Camp | Eligible | BLM |
| 5ME.18283 | Historic Open Camp | Needs Data | Private/BLM |
| 5ME.18439 | Historic Trash Scatter | Not Eligible | BLM |
| 5ME.18689.1 | Historic Road (Wagon Track Ridge) | Not Eligible | Private/BLM |
| 5ME.18690 | Open Camp | Eligible | BLM |
| 5ME.18691 | Open Camp | Eligible | BLM |
| 5ME.18692 | Open Camp | Eligible | BLM |
| 5ME.18693 | Open Camp | Not Eligible | BLM |
| 5ME.18694 | Open Camp | Eligible | Private |
| 5ME.18695 | Open Camp | Eligible | Private |
| 5ME.18696 | Open Camp | Eligible | Private |

| Site number | Site type | Eligibility | Landowner |
|---|---|---|---|
| 5ME.18697 | Open Camp | Not Eligible | Private |
| 5ME.18698 | Open Camp | Not Eligible | BLM |
| 5ME.18699 | Open Camp | Eligible | Private |
| 5ME.18700 | Open Camp | Eligible | BLM |
| 5ME.18701 | Historic Can Scatter | Not Eligible | Private |
| 5ME.18702 | Open Camp | Eligible | Private |
| 5ME.18703 | Open Camp | Eligible | Private |
| 5ME.18704 | Open Camp | Not Eligible | Private |
| 5ME.18705 | Sheltered Camp | Not Eligible | BLM |
| 5ME.18706 | Open Camp | Needs Data | Private |
| 5ME.18707 | Open Camp | Not Eligible | BLM |
| 5ME.18851 | Open Camp | Eligible | Private |
| 5ME.18852 | Open Lithic | Not Eligible | Private |
| 5ME.18853 | Open Camp | Not Eligible | Private |
| 5ME.18854 | Open Camp | Eligible | Private |
| 5ME.18855 | Historic, Animal Containment | Needs Data | Private |
| 5ME.18856 | Open Lithic | Not Eligible | Private |
| ** Site not relocated | | | |

Three of the previously recorded linear sites were given new segment numbers as part of the inventory. Of the combined total of 81 sites, 28 were field-evaluated as eligible for NRHP listing. Sites that may be eligible or potentially eligible for listing are shown in Table 3.4-3, below. Sites 5GF.4759 and 5ME.6445 may qualify as Ute traditional cultural properties, based on previous consultation with the Ute Indian Tribe.

#### 3.4.1.2 Environmental Consequences

**Proposed Action Alternative**

Direct impacts of construction have the potential to irreparably damage or destroy subsurface culturally sensitive sites. Impacts that affect the physical setting could result in a loss of characteristics that make an area significant. There may also be other unidentified culturally sensitive or significant locations in the area that have not been identified by the Ute tribes. Unauthorized modification of roads, pipelines and well pads may lead to impacts. The proximity of Native American sites to planned development within the study areas may result in indirect impacts that reduce the significance of resources by changing their setting, location and association.

Thirty-four sites have been identified within or adjacent to the proposed areas of disturbance. Of those, several are evaluated as eligible or needs data. Additionally, two linear sites evaluated as eligible, 5ME.924.7 and 5ME.11907.3, are within the impact areas. However, no portion of the segments recorded in the inventory show sufficient integrity to support the evaluation. Table 3.4-

3 summarizes NHRP-eligible sites located near, within, or adjacent to proposed areas of disturbance.

**Table 3.4-3**
**Potential Impacts and Mitigation Measures for NRHP-Eligible Sites within the APE**

| Site number | Potential Impact by Project Feature | Proximity to Proposed Disturbance | Site-Specific Management Recommendation |
|---|---|---|---|
| 5GR.4759 | Road Improvements/Access | Near road/No direct impact | No further work |
| 5GF.4762 | Pipeline Installation | About 45 ft. from proposed disturbance | No further work |
| 5GR.4765 | Pipeline Installation | About 5 ft. from proposed disturbance | Monitor |
| 5ME.1298 | Pipelines/Road improvements | Proposed disturbance passes through site | Monitor and Protect |
| 5ME.1550 | Pipelines/Road improvements | About 90 ft. from proposed disturbance | No further work |
| 5ME.3679 | Pipeline Installation | About 30 ft. from proposed disturbance | Monitor and Fence |
| 5ME.3680 | Pipelines/Road improvements | Proposed disturbance cuts northeast portion of site | Avoid and Protect or reroute disturbance |
| 5ME.3687 | Road Improvements/Access | Near road/No direct impacts | Monitor, Protect, Limit construction activity to existing road |
| 5ME.3726 | Pipelines/Road improvements | Proposed disturbance bisects the site | Monitor and keep disturbance to existing road |
| 5ME.3731 | Well Pad HSC 1-20 | 37 ft. from proposed disturbance, no direct impact | No further work |
| 5ME.3837 | Pipelines/Road improvements | Proposed disturbance bisects the site | Avoid, move proposed disturbance |
| 5ME.3845 | Well Pad HSC 1-22 | About 25 ft. form proposed disturbance, no direct impact | No further work |
| 5ME.6445 | Well Pad WT 12-16; Pipeline/Surface Water Pipeline | Well pad impacts site's south portion, proposed pipeline disturbance and alignment bisect site | Move well pad to avoid site; Site has been identified as being within an area of concern to the Ute Tribe during consultation |
| 5ME.7089 | Surface Water Pipeline | Alignment bisects the site | Monitor, Restrict construction to existing disturbance areas |
| 5ME7121 | Pipeline | About 65 ft. from proposed disturbance, no direct impact | Protect |
| 5ME.11907.3 (Supporting) | Pipeline to Well Pad HSC CF#3 | Alignment bisects the site in two places | Protect |
| 5ME.12147 (Needs Data) | Gas, Water Supply and Produced Water Pipelines | Proposed disturbance and alignment bisects the site | Monitor |
| 5ME.17996.3 | Pad HSC CF#3 | About 500 ft. from proposed disturbance | No further work |
| 5ME.18281 | Well Pad DC 1-13 | Within proposed well pad | Avoid and Protect/Move well pad |
| 5ME.18283 (Needs Data) | Pipelines/Road improvements | Proposed disturbance cuts east edge of site | Monitor |
| 5ME.18690 | Gas, Water Supply and Produced Water Pipelines | Proposed disturbance is adjacent to site boundary | Monitor and Fence |
| 5ME.18691 | Pipelines/Road improvements | Proposed disturbance is adjacent to site boundaries | Monitor and Fence |

| Site number | Potential Impact by Project Feature | Proximity to Proposed Disturbance | Site-Specific Management Recommendation |
|---|---|---|---|
| 5ME.18692 | Well Pad DBC 1-13, OHV Trail | About 138 ft. from edge of well pad. OHV trail runs 5 ft. from site | Protect, reroute OHV trail |
| 5ME.18694 | Pipeline/Road improvements | About 23 ft. from proposed disturbance | Monitor and Fence |
| 5ME.18695 | Gas, Water Supply and Produced Water Pipelines/Road improvements | Proposed disturbance cuts east edge of site | Monitor and Fence |
| 5ME.18696 | Pipeline Corridor | About 23 ft. from proposed disturbance | Monitor |
| 5ME.18699 | Pad HSC CF#2 | About 250 ft. from proposed disturbance, no direct impact | No further work |
| 5ME.18700 | Road Improvements/Access | About 75 ft. from proposed disturbance, no direct impact | No further work |
| 5ME.18702 | Pipeline Corridor/Centralized Facility | About 15 ft. from proposed disturbance About 42 ft. from facility | Monitor and Fence |
| 5ME.18703 | Surface Water Pipeline | Site is adjacent to proposed disturbance | Monitor and Fence |
| 5ME.18706 (Needs Data) | Pipeline corridor | Site is approximately 74 ft. from proposed disturbance, no direct impact | No further work |
| 5ME.18851 | Gas, Water Supply and Produced Water Pipelines | Site is partially within proposed disturbance | Monitor and Fence |
| 5ME.18854 | Surface Water Pipeline | Alignment bisects the site. Site would be adversely affected. | Avoid/Move alignment |
| 5ME.18855 (Needs Data) | Well Pad | Site is 160 ft. from proposed disturbance, would not be adversely affected | No further work |
| 5GF.4758.1 (Non-supporting) | Pipeline Installation | About 60 ft. from proposed disturbance | No further Work |
| 5GF.4758.2 (Non-supporting) | Road Improvements/Access | About 5 ft. from proposed disturbance | No further Work |
| 5ME.924.7 (Non-supporting) | Surface Water Pipeline | Alignment bisects the site | No further Work |

Increased development, easier access, construction, operation and maintenance may impact these sites and degrade their cultural significance by either destroying the sensitive area or its landscape setting. Impacts to auditory and visual environments may be important in considering values placed on some sites by Native American tribes and could impact such values.

No further work is recommended for the four linear sites that are evaluated as NRHP eligible. None of these four segments recorded and revisited retain sufficient integrity to support the evaluation.

### Protective/Mitigation Measures

Black Hills volunteered funds for alternative cultural mitigation, in consideration of potential cumulative effects to historic sites and to take into account possible effects to historic properties on un-inventoried private lands within the project area. A Memorandum of Agreement between the BLM and SHPO (BLM et al., 2013) to which Black Hills is a party, will provide specifications for development of site-specific treatment plans and for the use of the funds.

These BLM GJFO Standard COAs would apply, to minimize impacts to cultural resources:

- All persons in the area who are associated with this authorization will be informed that any person who, without a permit, injures, destroys, excavates, appropriates or removes any vertebrate fossil, historic or prehistoric ruin, artifact, object of antiquity, Native American remains, Native American cultural item, or archaeological resources on public lands is subject to arrest and penalty of law (16 USC 433, 16 USC 470, 18 USC 641, 18 USC 1170, and 18 USC 1361). Any heritage resource discovered requires that work in the area must stop and the BLM Authorized Officer notified. Strict adherence to the confidentiality of information concerning the nature and location of archeological resources would be required of the proponent and all of their subcontractors (Archaeological Resource Protection Act, 16 U.S.C. 470hh).
- The National Historic Preservation Act (NHPA) [16 USC 470s., 36 CFR §800.13], as amended, requires that if newly discovered historic or archaeological materials or other cultural resources are identified during the Proposed Action implementation, work in that area must stop and the BLM Authorized Officer (AO) must be notified immediately. Within five working days the AO will determine the actions that will likely have to be completed before the site can be used, assuming in place preservation is not necessary §800.13(b)(3).
- The Native American Graves Protection and Repatriation Act (NAGPRA) [25 USC 3001 et seq., 43 CFR 10.4] requires that if inadvertent discovery of Native American Human Remains or Objects of Cultural Patrimony occurs, any activity must cease in the area of discovery, a reasonable effort made to protect the item(s) discovered, and immediate notice be made to the BLM Authorized Officer, as well as the appropriate Native American group(s) (IV.C.2). Notice may be followed by a 30-day delay (NAGPRA §3(d)).
- If human remains are discovered on private or state land associated with this authorization, the BLM will notify the State of Colorado Archaeologist immediately, who will comply with Colorado Revised Statutes (Appendix) regarding the discovery of human remains (24-80-1302).
- In a new discovery situation, the operator may relocate activities to avoid the expense of mitigation and delays associated with this process, as long as the new area has been appropriately inventoried and has no resource concerns, and the exposed materials are recorded and stabilized. Otherwise, the operator will be responsible for mitigation costs. The BLM authorized officer will provide technical and procedural guidelines for relocation and/or to conduct mitigation. Upon verification from the BLM authorized officer that the required mitigation has been completed, the operator will be allowed to resume construction.

The BLM would also require the following additional project-specific protective measures to reduce any impacts to cultural resources (Table 3.4-3 provides detailed protective/mitigation measures for each potentially impacted site):

- Project components should be moved to avoid eligible or potentially eligible sites including proposed well pad WT 12-16 and possibly well pad DC 1-13. Proposed pipeline disturbance that would impact sites 5ME.3837, 5ME.18854 and possibly 5ME.3680 should be rerouted around the sites.
- Monitoring and fencing should be implemented where appropriate to protect eligible or potentially eligible sites.

**No Action Alternative**

Under this alternative, there would be no project-related impacts to cultural resources on BLM-administered lands from construction and operation of the Proposed Action.

### 3.4.2 Paleontological Resources

#### 3.4.2.1 Current Conditions

Paleontological resources include the remains or traces of any prehistoric organism preserved by natural processes in the earth's crust. The BLM manages paleontological resources for their scientific, educational and recreational values in compliance with the Paleontological Resources Preservation Act (PRPA) of 2009. The PRPA affirms the authority for many policies the BLM has for managing resources, such as issuing permits for collecting and curating paleontological resources and confidentiality of their locations. The law also defines prohibited acts, such as damaging or defacing paleontological resources and establishes both criminal and civil penalties.

The BLM classifies geologic formations to indicate the likelihood of significant fossil occurrence (usually vertebrate fossils of scientific interest) according to the Potential Fossil Yield Classification (PFYC) System for Paleontological Resources on Public Lands (BLM, 2007c). These classifications, Classes 1 to 5, determine the procedures to be followed prior to granting a paleontological clearance to proceed with a project.

The Proposed Action occurs on Quaternary alluvial and eolian sand and silt, and areas underlain by the Wasatch, Green River and Hunter Canyon formations. The Wasatch and Green River formations are known to yield fossil vertebrate remains, tracks and traces, invertebrates and plants throughout the Rocky Mountain region. Because the Wasatch and Green River formations are known to have a high to very high potential to yield scientifically significant fossils, they are considered to be a Class 4 or 5, depending on bedrock exposure. The Hunter Canyon Formation is generally rated as Class 3, with moderate to unknown potential of yielding important fossils.

In much of the project area, the bedrock formations are overlain by deposits of Quaternary (Holocene and Pleistocene) age including alluvium, colluviums and terrace and fan gravels. The Quaternary geologic unit is rated as a Class 2 to 3 with low to moderate or unknown potential for yielding scientifically significant fossils.

#### 3.4.2.2 Environmental Consequences

**Proposed Action Alternative**

The Proposed Action would not affect any known scientifically significant paleontological resources. However, construction, surface disturbing activities and increased human access could produce unexpected discoveries and potential paleontological resource damage. Direct impacts could include damage or destruction during construction, with subsequent loss of information. Indirect impacts would include fossil damage or destruction by erosion due to surface disturbance. The greatest potential for impacts is associated with surface and shallow bedrock disturbance. A pre-construction survey to locate where Wasatch Formation bedrock outcrop areas coincided with proposed disturbances would minimize effects to paleontological resources. Black Hills would comply with the BLM GJFO Standard Condition for paleontological resources regarding suspension of activity, protection of discovery from damage and notification of the BLM AO if any paleontological resources are discovered during construction.

**Protective/Mitigation Measures**

BLM would impose the following GJFO Standard COA, to minimize impacts to paleontological resources:

- The Paleontological Resources Preservation Act (PRPA) [16 U.S.C. 470aaa] requires the proponent to immediately suspend activities in the vicinity, protect the discovery from damage and notify the BLM Authorized Officer of any paleontological resources discovered as a result of operations under this authorization. The Authorized Officer will evaluate, or will have evaluated, such discoveries as soon as possible, but not later than 10 working days after being notified. Appropriate measures to mitigate adverse effects to significant paleontological resources will be determined by the Authorized Officer after consulting with the operator. Within 10 days, the operator will be allowed to continue construction through the site, or will be given the choice of either (1) following the Authorized Officer's instructions for stabilizing the fossil resource in place and avoiding further disturbance to the fossil resource, or (2) following the Authorized Officer's instructions for mitigating impacts to the fossil resource prior to continuing construction through the project area.

The BLM would also require these additional project-specific protective measures:

- Prior to construction, it should be determined if Wasatch Formation bedrock outcrop is present in any project area proposed for disturbance.
- If Wasatch Formation bedrock outcrop is present, a paleontological survey should be completed before the application is approved.
- An on-site monitor (BLM-permitted paleontologist) should be present during construction in areas of Wasatch Formation bedrock outcrop.

**No Action Alternative**

Under this alternative, there would be no project-related impacts to paleontological resources on BLM-administered lands resulting from construction of the Proposed Action.

### 3.4.3 Tribal and Native American Religious Concerns

#### 3.4.3.1 Current Conditions

American Indian religious concerns are legislatively considered under several acts and Executive Orders, namely the American Indian Religious Freedom Act of 1978 (PL 95-341), the Native American Graves Protection and Repatriation Act of 1990 (PL 101-601) and Executive Order 13007 (1996; Indian Sacred Sites). In summary, these require, in concert with other provisions such as those found in the NHPA and ARPA, that the federal government carefully and proactively take into consideration traditional and religious Native American culture and life and ensure, to the degree possible, that access to sacred sites, the treatment of human remains, the possession of sacred items, the conduct of traditional religious practices and the preservation of important cultural properties are considered and not unduly infringed upon. In some cases, these concerns are directly related to "historic properties" and "archaeological resources". In some cases elements of the landscape without archaeological or other human material remains may be involved. Identification of these concerns is normally completed during the land use planning efforts, reference to existing studies, or via direct consultation. General consultation for proposed vegetation treatment projects implemented under the National Fire Plan has been conducted with tribes who traditionally used the GJFO area. Concerns identified included eradication of sage, impacts to medicinal plants and general modern intervention in the

natural processes. Native American Indian consultation is currently pending for the proposed project.

#### 3.4.3.2 Environmental Consequences

**Proposed Action Alternative**

The Ute have a generalized concept of spiritual significance that is not easily transferred to Western models or definitions. As such, the BLM recognizes that they have identified sites that are of concern because of their association with Ute occupation of the area as part of their traditional lands. Some traditional cultural properties, natural resources, or properties of a type previously identified as being of interest to local tribes, may be found during the cultural resources inventory of the project area. If sites of interest to local tribes are found during inventory, consultation (including field visits to evaluate the sites, discuss the effects of the project and incorporate appropriate protection measures) will be made before implementation. On-the-ground consultation has occurred in this area and the BLM has been notified that parts of the project are in areas of concern for at least one of the Ute tribes.

**Protective/Mitigation Measures**

If new information is brought forward during tribal consultation, any site-specific Native American mitigation measures suggested during notification/consultation would be considered during the implementation of the Proposed Action and might require redesign for avoidance.

The BLM would require the following project/site-specific measures, to mitigate potential impacts to Native American concerns:

- Proposed well pad WT 12-16 should be moved to protect site 5ME.6445, identified during previous consultation as being located in an area of concern to the Ute Tribe.

- Tribal representatives have consulted with the BLM GJFO on similar projects and provided instructions for the protection of culturally sensitive sites should any be discovered during construction. If new information is provided by Native Americans during project implementation, additional or edited terms and conditions of mitigation may have to be negotiated or enforced.

**No Action Alternative**

Under this alternative, there would be no project-related impacts on BLM-administered lands from construction and operation of the Proposed Action.

### 3.4.4 Visual Resources

#### 3.4.4.1 Current Conditions

Visual Resource Management (VRM) is a system for evaluating and minimizing the visual impacts of surface-disturbing activities and maintaining scenic values. Visual resources in the BLM GJFO have been classified according to VRM analysis criteria. VRM objectives were established in the GJFO RMP (BLM, 1987). Table 3.4-4 summarizes BLM VRM classes. VRM is based on human perceptions and expectations in the context of the existing landscape. In order to meet its responsibility to maintain the scenic values of the public lands, BLM has developed a system addressing the fact that different levels of scenic values require different levels of management. Determining how an area should be managed first requires an assessment of the area's scenic values.

**Table 3.4-4**
**BLM Visual Resource Management Classes and Objectives**

| VRM Class | Visual Resource Objective | Change Allowed (Relative Level) | Relationship to the Casual Observer |
|---|---|---|---|
| **Class I** | **Preserve** the existing character of the landscape. Manage for natural ecological changes. | **Very Low** | Activities should not be visible and **must not attract attention**. |
| **Class II** | **Retain** the existing character of the landscape. | **Low** | Activities may be visible, but **should not attract attention.** |
| **Class III** | **Partially retain** the existing character of the landscape. | **Moderate** | Activities **may attract attention** but **should not dominat**e the view. |
| **Class IV** | Provide for management activities which require **major modification** of the existing character of the landscape. | **High** | Activities **may attract attention, may dominate** the view, but are still mitigated. |

Assessing scenic values and determining visual impacts can be a subjective process. Objectivity and consistency are greatly increased by using the basic design elements of form, line, color and texture. These elements have often been used to describe and evaluate landscapes, and also to describe proposed projects. The elements are used to detail landscape features, such as waterways, rock formations and vegetation (e.g., Form - flat to rolling terrain, Line - horizontal/diagonal, Color - tans to yellow, Texture - smooth to course). Proposed projects that can repeat these design elements are usually in harmony with their surroundings; those that do not create contrast. By adjusting project designs so the elements are repeated, visual impacts can be minimized. To properly assess the contrasts between the proposed and existing situation, it is necessary to break each down into the basic features (i.e., landform/water, vegetation and structures) and basic elements (i.e., form, line, color and texture) so that the specific features and elements causing contrast can be accurately identified.

In 2009, a Visual Resource Inventory (VRI) was conducted for the GJFO in anticipation of updating the VRM classes for the GJFO RMP revision. The inventory process consists of a scenic quality evaluation, sensitivity level analysis and a delineation of distance zones. Based on these three factors, BLM-administered lands are placed into one of four visual resource inventory classes. These inventory classes represent the relative value of the visual resources. Classes I and II being the most valued, Class III representing a moderate value and Class IV being of least value. Inventory classes are informational and provide the basis for considering visual values in the RMP process.

The proposed project locations lie within five different scenic quality rating units (SQRUs 08, 17, 19, 20 and 22). The Homer Deep Unit lies within SQRUs 8 and 17, classified as VRI Class III. South Shale Ridge and Cow Ridge lie to the south and north of the Homer Deep Unit and were inventoried as VRI Class II, a more visually sensitive classification. The remaining proposals lie in SQRUs 19, 20 and 22, inventoried as Class IV, where activities may be allowed to dominate a view, but would still be mitigated.

South Shale Ridge is a dominating landscape feature in the middle of the project area dividing the Homer Deep and Winter Flats units. The west-east running ridge is a heavily eroded, 8-mile long feature. The southern face is steep and multi-colored, with flanks speckled by pinyon pine,

juniper, Gambel oak and sagebrush. The feature is visible as the background, middle ground and foreground from most points along Mesa County V.2 Road to observers approaching from the east, west, or north.

Garfield County roads 200 and 222 (Dry Fork Road) runs east-west on the north side of South Shale Ridge. This road, which would service the Homer Deep Unit, runs along the Dry Fork Creek drainage and through several parcels of private land. The road also accesses High Lonesome Ranch, an area outfitter and working cattle ranch. Views along Dry Fork Road encompass the brush covered bottomlands along the Dry Fork, the pinyon-juniper forested north side of South Shale Ridge and the steep, rugged grey-toned faces of Cow Ridge to the north. Several structures, powerlines, spur roads, agricultural fields, areas of surface disturbance and existing oil and gas developments are visible along this route.

The DeBeque Canyon of the Colorado River is another prominent landscape feature for travelers on Interstate-70. The canyon forms a narrow passage where the river passes along the western end of the Grand Mesa and contains scenic cliff walls and side canyons. The Horseshoe Canyon Unit sits atop the bluffs on the east side of the Colorado River and Interstate-70 at the eastern end of the canyon. The areas above the DeBeque Canyon currently contain several active and old wells and associated access roads.

The project area coincides with the 1987 RMP VRM Class III areas on BLM-administered lands (see Map 3.4-1). VRM Class III area objectives allow for a moderate level of change to the existing landscape, but should not dominate an observer's view. Most of the project area would also coincide with lands that are unclassified under the VRM system in the 1987 RMP. However, the VRI classes mentioned above are indicative of existing values and reflect management objectives in the GJFO 2013 Draft RMP.

Additionally, the South Shale Ridge and the Interstate-70 corridor are designated as having special Scenic and Natural Values (SNV) under the RMP.

#### 3.4.4.2 Environmental Consequences

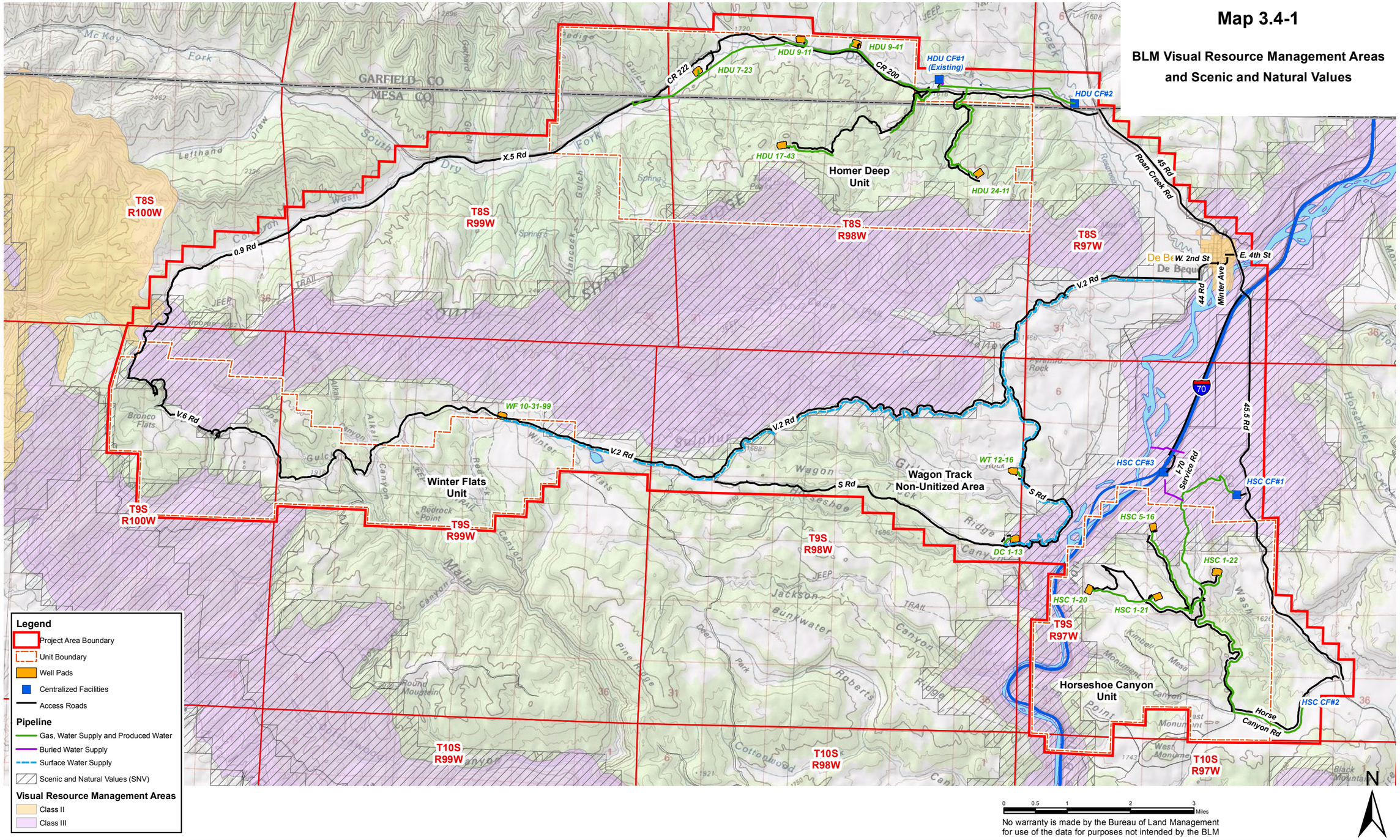
**Proposed Action Alternative**

Generally, visual resources would be impacted by surface disturbing activities, fugitive dust and the presence of well pads and centralized facilities. Construction of well pads, pipelines, road upgrades and centralized facilities would be a major cause of surface disturbance under the Proposed Action. These activities would create impacts to the visual setting that include contrasts in line, form, color and texture, (as described above) depending upon site-specific landscape characteristics.

As analyzed, about 300 acres of new surface disturbance would occur under the Proposed Action, including 55.7 acres on SNV lands, and 45 acres on VRM Class III lands (1987 RMP). About 24.2 miles of new pipeline is proposed, of which 19.0 miles would be laid on the surface for temporary use during construction. However, this analysis is for 10-acre well pads and well pads would not be larger than 6.8 acres each. Pipelines would contrast the line, texture and form elements of the landscape by introducing visible, irregular lines created by the edge effects of clearings and roads. These features would also present marked breaks and changes in the texture and color of the vegetation and landform patterns present. Well pad surface disturbance would impact visual line and texture elements in much the same way.

## Map 3.4-1

**BLM Visual Resource Management Areas and Scenic and Natural Values**



The Horseshoe Canyon and Wagon Track areas coincide with the Interstate-70 Corridor SNV and VRM Class III areas (see Map 3.4-1). Two proposed well pads (HSC 5-16 and DC 1-13) would be located on BLM-administered lands within the designated Interstate-70 corridor SNV area. Site-specific VRM observations and mitigation measures would be developed at on-site inspections before APD approval.

One well pad is proposed for the Winter Flats Unit. It would be located near several existing roads and well pads in an area unclassified by the 1987 RMP. The 2009 inventory rates this area as VRI Class IV, of the least value. The proposed well pads in the Homer Deep Unit, two in Horseshoe Canyon Unit and one in the Wagon Track area are also on lands not classified for VRM by the 1987 RMP. The Homer Deep Unit proposed pads would be in a VRI Class III area, with the exception of well pad HDU 9-41, which straddles VRI Class III and Class II areas. The proposed well pads in the Horseshoe Canyon Unit and Wagon Track area would be in a VRI Class III area.

Proposed well pads HDU 9-11 and HDU 9-41 along Garfield CR 200, and well pad HDU 7-23 along Garfield CR 222 would be visible from Dry Creek Road during construction and drilling. During these times, it is possible that HDU 9-11 and 9-41 would dominate the view of the casual observer using Dry Fork Road because of the close proximity of the well pads to the road. Because of the existing development (roads, power lines, well pads, structures, other surface disturbance), the well pads are not expected to be a dominant feature of the landscape during well operation and upon site reclamation. Proposed wells and the existing access roads in the Horseshoe Canyon Unit would not be visible to travelers on Interstate-70 because of the steep canyon walls along this stretch. Casual observers using the BLM and spur roads in these areas would also be exposed to dust, surface disturbance, increased traffic and drilling activities during construction. Observers using Mesa County 45.5 Road (the DeBeque Cutoff) would be exposed to the construction and operation of HSC CF#1 (proposed for location on private land), but the proposed well pads and associated facilities in the area would be screened off by terrain features.

Although nearly all proposed well pads, pipelines and road improvements would be in areas adjacent to existing surface disturbance, site-specific measures for visual resources may still be necessary and BMPs for VRM for Fluid Minerals would be also be conducted here as part of the Proposed Action. These include proper site selection, reducing unnecessary surface disturbance, choice of color and final reclamation strategies.

All of the proposed centralized facilities and one well pad would be located on private lands not subject to the BLM VRM guidelines. Black Hills would apply BMPs for VRM on private lands to the extent practical.

Black Hills would paint all permanent above-ground facilities a natural color that blends with the background landscape, in a non-reflective finish. This would allow the facilities to blend with the natural environment. Cut and fill effects from pipelines and well pads would also introduce distinct color and texture contrasts by exposing bare soils in areas where darker native vegetation and topsoil comprise the existing landscape color elements. As much as possible, facility construction and placement would utilize natural landscape features to screen operations for observers.

Terrain, climate and native vegetation types can make successful reclamation and revegetation difficult and time consuming. However, if reclamation was diligent and revegetation successful, some elements of the Proposed Action might not dominate a casual observer’s view and could meet visual resource management objectives.

**Protective/Mitigation Measures**

The following BLM GJFO Standard COAs would help minimize impacts to visual resources:

- Pads, roads, pipelines and production facilities should be located and placed to avoid or minimize visibility from travel corridors, residential areas and other sensitive observation points, unless directed otherwise by the BLM, and should be designed to maximize reshaping of cut/fill slopes and interim reclamation of the pad.
- To the extent practical, existing vegetation should be preserved when clearing and grading for pads, roads, and pipelines. Tree or shrub removal may be required by cutting or by shredding, to provide slope stability or leave root systems in place. BLM may direct that cleared trees and rocks be salvaged and redistributed over reshaped cut-and-fill slopes or along linear features.
- To mitigate straight-line visual contrast effects of cut/fill slopes, pad margins or cleared vegetation, adaptive management techniques may be required by the BLM before or after construction. Example: Additional tree removal along contrasting edges, to create irregularly shaped openings or natural-looking mosaic patterns; texturing or coloring surfaces to mitigate visual contrasts.
- To blend with the natural environment, all permanent above-ground facilities placed on the location will be painted a natural color to blend with the background landscape, in a non-reflective finish. A BLM Standard Environmental Color may be specified.

These additional project-specific measures would be required by the BLM, to further mitigate impacts to visual resources under the Proposed Action:

- Visual Contrast Rating evaluations and/or Sensitivity Rating evaluations should be conducted on a site-specific basis, based on BLM on-site inspections.
- Outdoor lighting on facilities and/or drilling rigs should be down-directed, with fixtures having a 90 degree cutoff, to eliminate glare and minimize upward light scattering.
- For all project components, a detailed, site-specific inventory and plan describing how the proposal would meet the VRM classification of the area should be required.
- In highly visible areas, tanks should be low-profile or set in-ground to minimize visual dominance.
- As practical and per VRM evaluation, use of gravels or soils for surfacing roads and pads should avoid high color and textural contrast with the native soil and rock components – e.g., no river cobbles or pit run.

**No Action Alternative**

Under this alternative, there would be no project-related impacts to visual resources on BLM-administered lands from construction and operation of the Proposed Action.

### 3.4.5 Socioeconomics

#### 3.4.5.1 Current Conditions

The project area is located in Northwest Colorado. Led by an expanding energy industry, particularly natural gas and oil development, the economy of this mostly rural region of the state has experienced dramatic upswings and downturns since 2000; generally trending upward. Mesa County is the dominant population and economic center in Northwest Colorado and Grand Junction (population 58,566) is the largest city in western Colorado and a regional center

for trade and government services. To date, Garfield County has been the hub of natural gas production in Northwest Colorado (as defined by the Colorado Department of Local Affairs - CDOLA, Northwest Colorado includes Garfield, Mesa, Moffatt, Rio Blanco and Routt counties). In recent years, natural gas development has strengthened economic ties and increased worker commuting between Mesa and Garfield counties. The project area is in northern Mesa County, near the Town of De Beque (population 504), which is located in a ranching valley 30 miles northeast of Grand Junction and 3 miles from the Garfield County border. The De Beque area offers a variety of outdoor recreation and tourism opportunities, including hunting, fishing, canoeing, biking, motorized recreation, hiking, rock climbing and guest ranches.

**Population.** Between 1990 and 2000, Mesa County's population increased 25 percent, from 93,145 to 116,255; and Garfield County's population increased 46 percent, from 29,974 to 43,791. This growth compares with a statewide growth rate of 31 percent over the same period. Between 2000 and 2010, Mesa County's population increased 26 percent, to 146,723; and Garfield County's population increased 29 percent, to 56,389, compared to a statewide growth rate of 17 percent (U.S. Census Bureau, 1991, U.S. Census Bureau, 2001, U.S. Census Bureau, 2011a). The CDOLA projects that Colorado's population will increase by 19 percent between 2010 and 2020. During this time, Mesa County's population is projected to increase 17 percent, to 171,581; and Garfield County's population is projected to increase 36 percent, to 76,939 (CDOLA, 2012a).

**Income and Employment**

*Income.* Personal income measures the income that individuals receive through earnings, asset ownership and transfer receipts (*i.e.* income received for services not currently rendered). Earnings, which include proprietor, self-employment and wage income, typically comprise a large portion of personal income. In 2010, earnings contributed 68.6 percent to per-capita personal income in Colorado, 59.2 percent in Mesa County and 67.9 percent in Garfield County. Investment income (dividends), interest and rent, accounted for 18.0 percent of per-capita personal income in Colorado, 20.7 percent in Mesa County and 20.2 percent in Garfield County. Transfer receipts, which include retirement and pension benefits, disability and unemployment insurance benefits, medical payments and veteran's benefits, accounted for 13.4 percent of per-capita personal income in Colorado, 20.1 percent in Mesa County and 11.9 percent in Garfield County (Bureau of Economic Analysis - BEA, 2012).

Between 2000 and 2010, per-capita personal income grew more rapidly in Mesa and Garfield counties than in Colorado as a whole. During this time, per-capita personal income increased from $33,977 to $42,451 in Colorado (25 percent increase), from $25,565 to $34,281 (34 percent increase) in Mesa County and from $29,080 to $37,112 (28 percent increase in Garfield County (BEA, 2012).

*Industry Employment*. Over the past decade, the effect of national economic conditions on employment in Mesa and Garfield counties has been intensified by expanding oil and gas activities and related increases in regional service industries. Between 2000 and 2008, employment in Mesa County increased nearly 30 percent, from 49,947 to 64,484 wage-paying jobs. Over 40 percent of the jobs created were in the Mining (2,590 new jobs) and Construction (2,212 new jobs) sectors. The number of wage and salary jobs in Garfield County increased from 19,190 in 2000 to 28,648 in 2011, for a 49 percent rise in employment. Over 42 percent of the jobs created in Garfield County were in the Mining (2,603 new jobs) and Construction (1,361 new jobs) sectors.

Impacted by the national economic downturn, between 2008 and 2011, wage and salary employment fell 11 percent in Mesa County (6,779 lost jobs) and 17 percent in Garfield County (4,889 lost jobs). The greatest jobs losses were in the Construction (2,626 lost jobs in Mesa County and 2,398 lost jobs in Garfield County) and Retail Trade (868 lost jobs in Mesa County and 830 lost jobs in Garfield County) sectors. Despite this turbulence, between 2000 and 2011, total wage and salary employment increased nearly 16 percent in Mesa County and 24 percent in Garfield County. In 2011, total employment included 57,705 jobs in Mesa County and 23,759 jobs in Garfield County. In both counties, the greatest job gains were in the Mining and Health Care & Social Assistance sectors (Colorado Department of Labor and Employment - CDLE, 2012).

In 2011, annual wages in Mesa County averaged $39,187 and were highest in the Management of Companies & Enterprises ($87,090) and Mining ($72,678) sectors and lowest in the Accommodation & Food Services ($15,475) and Arts, Entertainment & Recreation ($13,814) sectors. In 2011, annual wages averaged $44,604 in Garfield County. Wages were highest in the Mining ($78,023) and Utility ($74,320) sectors and lowest in the Arts, Entertainment & recreation ($18,971) and Accommodations & Food Services ($18,227) sectors (CDLE, 2012).

*Recreation-Based Employment.* Recreation-based tourism, including hunting, fishing, outfitting and guiding, contributes to employment in the project area. The travel industry is not represented by a single industrial sector, but includes businesses in several industries, primarily the Accommodation and Food Services, Transportation and Retail sectors. According to a 2011 study commissioned by the Colorado Tourism Office, in 2011 the total economic impacts of travel spending by overnight visitors were $252.6 million in Mesa County and $132.4 million in Garfield County. This spending supported 2,870 jobs in Mesa County (5 percent of all jobs in the county) and 1,440 jobs in Garfield County (6.1 percent of all jobs in the county). In 2011, annual earnings in the travel industry averaged $19,268 in Mesa County and $25,486 in Garfield County (Dean Runyan Associates, 2012).

*Unemployment Rates*. During the 1990s, annual unemployment rates ranged between 4.2 and 7.5 percent across the United States, 3.0 and 6.0 percent across Colorado, 3.8 and 7.9 percent in Mesa County and 2.8 to 8.9 percent in Garfield County. Unemployment tended to be lower in all jurisdictions between 2000 and 2008, when unemployment rates ranged between 4.0 and 6.0 percent across the United States, 2.7 and 6.1 percent across Colorado, 3.2 and 5.6 percent in Mesa County and 2.5 and 5.0 percent in Garfield County. Due to the national economic contraction that began in 2008, unemployment rates increased in all jurisdictions. Between 2008 and 2011, the unemployment rate increased from 5.8 percent to 8.9 percent across the United States, from 4.8 percent to 8.6 percent in Colorado, from 3.9 percent to 9.9 percent in Mesa County and from 3.1 percent to 8.7 percent in Garfield County (Bureau of Labor Statistics – BLS, 2012).

*Oil and Gas Production***.** Between 2001 and 2012, natural gas production in Northwest Colorado increased nearly 500 percent; from 142.4 trillion cubic feet in 2001 to 841.1 trillion cubic feet in 2012. During this time, oil production in Northwest Colorado increased 18 percent; from 6.9 million barrels in 2001 to 8.1 million barrels in 2012. Most of this production is north of Mesa County. Between 2001 and 2012, Garfield County accounted for 80 percent of the region's natural gas production and Rio Blanco County accounted for 75 percent of its oil production. During this time, Mesa County accounted for approximately 5 percent of the natural gas production and 1 percent of the oil production in Northwest Colorado (COGCC, 2013).

*Fiscal Conditions*. Property tax, sales and use tax and intergovernmental transfers are major sources of revenue to Mesa and Garfield county governments. In Mesa County,

intergovernmental transfers, which include distributions of severance tax and federal mineral leases paid on mineral extraction, accounted for an average of 27 percent of annual county revenues between 2006 and 2011. During this time, sales and use tax accounted for an average of 20 percent and property taxes accounted for an average of 17 percent of annual Mesa County revenues. Total revenues to Mesa County government increased from $141 million in 2006 to $177.3 million in 2010. Due to contracting economic conditions, county revenues fell to $150 million in 2011. In recent years, increases in property tax and intergovernmental revenues have offset losses in sales tax and other revenue sources (Mesa County, 2012b).

Property tax makes a more sizeable contribution to county finances in Garfield County. Between 2006 and 2011, property tax contributed an average of 41 percent to annual Garfield County revenues; intergovernmental revenues contributed an average of 31 percent and sales and use tax contributed an average of 7 percent to annual county revenues. Total revenues to Garfield County government increased from $77.6 million in 2006 to $154.4 million in 2010 and fell to $101.3 million in 2011. Increases in property tax and intergovernmental revenues have partially offset losses in sales and other revenue sources (Garfield County, 2012).

Natural gas production affects a county's fiscal status largely through its impact on the property, or ad valorem, tax base. The total assessed valuation on taxable property in Mesa County more than doubled between 2000 and 2011, increasing from $807.1 million to over $2.0 billion. The increase in assessed valuations in Garfield County was even more dramatic, increasing from $612.6 million to nearly $3.8 billion between 2000 and 2011 (CDOLA, 2012b).

Between 2000 and 2011, oil and natural gas activities accounted for 19 percent of the increase in Mesa County's total assessed valuation. During this time, the assessed value of oil and gas in Mesa County increased from $9.4 million to $243.9 million. In 2011, oil and gas accounted for 12 percent of Mesa County's assessed valuation. Oil and gas contribute more substantially to Garfield County revenues than they do to Mesa County's. Between 2000 and 2011, oil and gas accounted for 83 percent of the increase in assessed valuations in Garfield County. During this time, the assessed valuation of oil and gas in Garfield County increased from $93.2 million to $2.7 billion. In 2011, oil and gas accounted for 72 percent of the county's total assessed valuation (CDOLA, 2012b).

*Housing*. According to a 2009 housing study commissioned by Mesa County, most of the workers in the oil and gas industry who reside in Northwest Colorado live in Mesa County (Leland Consulting Group, 2009). Most of the county's rental units are in Grand Junction, where, in the third quarter of 2012, the average apartment vacancy rate was 3.8 percent and the average rent was $639 per month (Throupe and Von Stroh, 2012). The towns of De Beque, Collbran, Palisade, Parachute and Rifle provide additional housing opportunities for workers in the project area, particularly those who choose to rent. Most of the housing stock in these towns consists of single-family and mobile homes.

Short-term housing accommodations closest to the project area are in the town of Parachute, 12 miles to the northeast. An internet search of lodging accommodations found four motels with over 260 rooms in Parachute and several motels with over 630 rooms in Rifle, 31 miles northeast of the project area. In addition, there are approximately 90 recreational vehicle sites in Rifle.

**Public Safety**

*Medical Services*. Physicians and other medical practitioners in Collbran, Parachute, Rifle and Grand Junction provide medical services to De Beque area residents. The Plateau Valley Medical Clinic in Collbran provides family practice services, emergency/urgent care, x-ray and lab services. The Battlement Mesa Medical Center near Parachute is part of the Grand River

Hospital District and offers family practice services, specialty physicians and physical therapy treatment.

The nearest hospitals are in Rifle and Grand Junction. The Grand River Medical Center and Hospital in Rifle provides family health, internal medicine, orthopedic, cardiopulmonary, surgery, radiology, physical therapy and lab services. The hospital has 25 beds and includes a Level 4 Trauma Center with flight-for-life service to Salt Lake City and Denver. St. Mary's Hospital and Regional Medical Center in Grand Junction has 318 beds and is a regional center for cardiovascular and orthopedic services, trauma care and surgery. Grand Junction's Community Hospital is an acute care facility with 78 beds.

*Emergency and Fire Protection Services*. The De Beque Fire Department provides fire protection services in the project area. It has six paid and four volunteer firefighters. All six paid personnel are emergency medical response providers. If needed, the Plateau Fire Protection District in Collbran and Parachute Fire Department dispatch additional firefighting personnel to the De Beque area (Marks, 2012).

*Law Enforcement*. The De Beque Marshal Department provides first-call police services in the project area. The Marshal Department has two officers on staff. Most of the offenses in the project area reported to the Marshal Department and Mesa County Sheriff's Office are related to larceny, burglary and assault (Smith, 2012).

#### 3.4.5.2 Environmental Consequences

**Proposed Action Alternative**

Most project-related socioeconomic impacts, including those related to population, employment, government revenues, housing and safety and emergency services would be associated with workforce size and the length of time construction and operations would continue in the project area. Workforce requirements and local socioeconomic impacts would be greatest during the construction phase. Although the production phase would employ fewer workers and have lower impacts on employment and income than during construction, the Proposed Action's fiscal impacts would continue through production, which is estimated at 20 years. Most of the socioeconomic impacts would occur in Mesa County, where nine proposed well pads are located. Government revenues in Garfield County would also be affected because three well pads are proposed in that county.

**Population**

Black Hills estimates that approximately 50 percent of the construction workforce would be local. The workforce needed to develop a natural gas field is transitory because drilling and completion crews tend to travel to where fields are being explored and developed. Consequently, the construction workforce for the Proposed Action would not be expected to impact regional population trends. Due to its small size, the production workforce would not impact regional or local populations.

**Employment and Income**

Direct employment benefits of the Proposed Action include 151 construction jobs and four year-round production jobs. In 2011, annual wages earned in industries supporting the drilling of oil and gas wells averaged $82,401 in Mesa County and $80,164 in Garfield County. Average annual wages earned in industries supporting oil and gas operations were $70,374 in Mesa County and $62,991 in Garfield County (BLS, 2012).

The Proposed Action would also generate indirect economic benefits to local and regional businesses through the operator's purchases of goods and services needed to develop and

operate the Proposed Action. The demand for goods and services would be further stimulated by the Proposed Action's workforce and by workers employed by businesses that support the Proposed Action and its workforce. Most of these regional benefits would likely occur in the towns of Grand Junction, De Beque, Parachute and Rifle where most local oil and gas service businesses are located.

Construction of the Proposed Action could result in short-term impacts to recreation-based tourism in the project area. Localized effects during construction would be strongest on businesses and recreational activities located near proposed well pads. The High Lonesome Ranch is located near proposed well pads HDU 7-23 and HDU 9-11; guest ranch headquarters are approximately 0.4 miles from HDU 7-23 and kennels and pheasant-rearing facilities are approximately 0.6 miles from HDU 9-11. Impacts due to construction-related disturbances, including traffic, noise, dust and lighting, would be most intense during drilling and completion activities on these well pads. Long-term impacts during the production phase would be fewer and less intense.

**Fiscal Conditions**

Natural gas production in the project area would provide economic benefits to federal, state and local governments through the generation of federal mineral lease (FML) royalties, severance tax and property (ad valorem) tax on natural gas production. Black Hills estimates full field production of up to 144 bcf of natural gas over the life of the project. Assuming a project life of 20 years, this corresponds with an average production level of 6 bcf per well. Natural gas production rates are typically highest when a well is drilled, decline rapidly and level off after about 10 years. For simplicity, the analysis of fiscal impacts assumes an annual production level of 300 mmcf per well. This estimate is an annual average and does not imply that any single well would produce at this level each year. All tax estimates assume a natural gas price of $2.70 per million Btu (British thermal units) (Energy Information Administration - EIA, 2012).

*FML Royalties.* With the exception of two wells in the Horseshoe Canyon Unit (on proposed well pad HSC 1-22), wells would be located on federal mineral leases and subject to a FML royalty rate of 12.5 percent on the net revenues (gross revenues less transportation and processing costs and administrative charges) from extracted natural gas. Under the assumptions noted above, the 22 wells would each generate $86,673 in annual FML royalties. Of this total, $44,203 (51 percent) would be distributed to the federal government and $42,470 (49 percent) would be distributed to the State of Colorado. Nearly half of Colorado's portion of FML royalties would be used to fund public education and the remainder would be used to assist communities impacted by the mineral extraction industry and fund water storage projects.

*Severance Tax Revenue.* Severance tax on natural gas production varies between 2 and 5 percent of gross annual income. Exemptions, including transportation, manufacturing and processing costs; royalty and property tax liabilities, reduce the effective severance tax rate to between 1 and 2 percent of total production value (Colorado Governor's Office of State Planning and Budgeting, 2007). An effective severance tax rate of 1.25 percent has been used widely to estimate the fiscal impacts of oil and gas production in Northwest Colorado (BBC Research and Consulting - BBC, 2008). Based on this effective tax rate, each FML well would generate $9,294 in annual severance tax revenues and each well on private leases would generate $10,622 in annual severance tax revenues to the State of Colorado. Severance tax revenues would be used to fund programs administered by the Colorado Geological Survey, Division of Minerals and Geology, Water Conservation Board, Colorado Parks and Wildlife and local governments in areas impacted by the mineral extraction industry.

*Property Tax Revenue.* Property taxes would be paid to Mesa and Garfield counties. Black Hills expects that 18 of the proposed wells would be in Mesa County and that 6 wells would be in Garfield County. Based on 2011 mill levies, a well in the Winter Flats Unit and Mesa County portion of the Homer Deep Unit would generate $15,612 in annual property taxes to Mesa County. A well in the Wagon Track Non-Unitized Area and Horseshoe Canyon Unit would generate $28,127 in annual property taxes to Mesa County. The primary recipients of these property tax revenues would include the Mesa County General Fund, De Beque Joint School District (#J-49), Collbran School District (#50), the De Beque and Plateau Valley fire protection districts, Plateau Valley Hospital, Mesa County Road and Bridge and the Mesa County Library District.

A well in Garfield County would generate $18,851 in annual property taxes. The primary recipients of these property tax revenues would include the Garfield County General Fund, De Beque Joint School District, De Beque Fire Protection District, Grand River Hospital District and Garfield County Road and Bridge.

*Sales and Use Tax Revenue.* The Proposed Action would generate sales tax revenue to Mesa and Garfield counties through the sales of taxable goods purchased in each county. Mesa County could also receive use tax revenue from goods purchased elsewhere and imported into the county. Most sales and use tax revenue would result from retail expenditures by Black Hills' employees, its contractors and individuals whose jobs would be supported by the Proposed Action. Sales and use tax receipts would be highest during construction.

**Housing**

The Proposed Action is not expected to have a substantial impact on Mesa County or De Beque's housing market. The influx of new production workers and their families into the region would be within the absorptive capacity of regional communities such as De Beque, Collbran, Palisade, Parachute and Rifle. Potential impacts on property values near the project area and access route due to traffic and activities associated with project construction would be short-term. Proposed well pad HDU 7-23 would be approximately 0.4 mile from one residence and approximately 0.8 mile from a second residence. Proposed well pad HDU 9-41 would be approximately 0.4 mile from a residence. All other residences would be located more than 1 mile from a proposed well pad and project operations are not expected to have a long-term impact on property values in the surrounding area.

The construction workforce would not be likely to have a substantial impact on the region's short-term housing market. Black Hills expects that local workers would comprise approximately half of the construction workforce. Therefore, the demand for short-term housing would peak with approximately 75 non-local workers during the first two years of construction. This potential peak demand corresponds to approximately 8 percent of the motel rooms in Parachute in Rifle.

**Public Safety**

*Medical Services.* The Proposed Action would not be expected to have a substantial impact on medical service providers in the region.

*Emergency and Fire Protection Services.* The Proposed Action could increase demands placed on De Beque Fire Department personnel and equipment, as well the department's requests for supplementary firefighting personnel from the Plateau Fire Protection District and Parachute Fire Department.

*Law Enforcement.* Many rural communities near areas with active oil and gas development have experienced, or are concerned about, increased crime along with an influx of non-resident

temporary workers (BBC, 2011; Blankenship Consulting/Sammons Dutton, 2006). Rig activity is a good indicator of non-resident populations associated with oil and gas development, as well as potential increases in non-violent crimes (Jacquet, 2005). Because no more than two drilling rigs would be active in the project area at any given time, the Proposed Action is not expected to increase response demands on the De Beque Marshal Office. In addition, short-term housing accommodations for the estimated 75 non-local workers associated with construction of the Proposed Action are spread across neighboring communities, further reducing the potential for increased law enforcement demands on any single law enforcement agency.

**Protective/Mitigation Measures**

The BLM has not identified any protective/mitigation measures to address potential socioeconomic impacts.

**No Action Alternative**

Under the No Action Alternative, there would be no jobs or income associated with the construction and operation of wells and infrastructure associated with the Proposed Action. The federal government would not receive FML royalty revenues, the State of Colorado would not receive FML royalty or severance tax revenues and county governments would not receive property tax revenues. There would be no potential increase in the demand for law enforcement services due to offenses perpetrated by natural gas construction workers.

### 3.4.6 Environmental Justice

#### 3.4.6.1 Current Conditions

Executive Order 12898 requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects of their programs, policies and activities on minority populations and low-income populations (defined as those living below the poverty level). In 2010, minorities, including persons of African American, American Indian, Asian, Pacific Islander, or Hispanic descent, comprised 30 percent of the population in Colorado, 17 percent of the population in Mesa County and 31 percent of the population in Garfield County (U.S. Census Bureau, 2011a). In 2010 low-income populations comprised 13 percent of Colorado's population, 14 percent of Mesa County's population and 9 percent of Garfield County's population (U.S. Census Bureau, 2011b).

#### 3.4.6.2 Environmental Consequences

**Proposed Action Alternative**

Overall, Mesa County contains a lower portion of minority populations and a comparable portion of low-income populations as compared to statewide minority and low-income populations. Garfield County contains a comparable portion of minority populations and a lower portion of low-income populations as compared to stateside populations. Therefore, the Proposed Action would not result in disproportionately high and adverse human health or environmental impacts on minority or low-income populations.

**Protective/Mitigation Measures**

The LM has not identified any protective/mitigation measures to address potential impacts to environmental justice.

**No Action Alternative**

Under the No Action Alternative, construction and operations would not occur and there would be no potential impacts on minority and low-income populations.

### 3.4.7 Transportation/Access

#### 3.4.7.1 Current Conditions

Table 3.4-5 shows 2011 annual average daily traffic volumes for trucks and all vehicles on segments of Interstate-70 in the vicinity of the project area.

**Table 3.4-5**
**Annual Average Daily Traffic on Interstate-70**
**in the Vicinity of the Project Area: All Vehicles and Trucks, 2011[1]**

| | Segment Milepost | | 2011 | |
|---|---|---|---|---|
| **Interstate 70 Road Segment** | **Start** | **End** | **All Vehicles** | **Trucks** |
| Grand Junction (West of 24 Road) to 24 Road underpass | 25.56 | 27.57 | 16,000 | 2,540 |
| 24 Rd underpass to Horizon Dr interchange (Walker Field Rd) | 27.57 | 31.35 | 22,000 | 3,180 |
| Horizon Drive interchange to Clifton Business Route | 31.35 | 36.64 | 21,000 | 2,690 |
| Clifton Business Route to Palisade (SH-6 interchange) | 36.64 | 41.58 | 20,000 | 2,720 |
| SH-6 interchange to Palisade overpass | 41.58 | 43.68 | 16,000 | 1,930 |
| Palisade overpass to north of SH-65 | 43.68 | 49.02 | 22,000 | 2,950 |
| North of SH-65 to DeBeque (Mesa County Roads 45 & 45.5) | 49.02 | 61.65 | 16,000 | 2,330 |
| DeBeque to Garfield County Road 215/Battle Mesa Parkway | 61.65 | 64.87 | 14,000 | 2,210 |
| Garfield County Road 215 to Parachute | 64.87 | 74.68 | NA[2] | NA[2] |
| Parachute to west of SH-6 | 74.68 | 81.24 | NA[2] | NA[2] |
| West of SH-6 to east of SH-6 near Rifle | 81.24 | 86.85 | NA[2] | NA[2] |
| Rifle to west of SH-70 spur (9th Street) in Silt | 86.85 | 90.42 | 15,000 | 2,250 |
| West of SH-70 spur to east of SH-70 in Silt | 90.42 | 97.43 | 18,000 | 2,240 |

[1] Source: CDOT, 2012.
[2] NA = not available

Table 3.4-6 shows average daily traffic volumes on Mesa County roads and De Beque town streets near the project area. The limited and dated traffic counts that are available for De Beque town streets do not necessarily reflect traffic increases due to expanded energy development near De Beque in recent years (Town of De Beque, 2009). The Garfield County Road and Bridge Department does not maintain traffic counts for Garfield County roads 200 and 222 (Dry Fork Road).

**Table 3.4-6**
**Traffic Volumes on Mesa County Roads and De Beque Town Streets near the Project Area[1]**

| **Road** | **Segment** | **Year** | **Average Daily Traffic** |
|---|---|---|---|
| 45 Roan (Roan Creek Road) | 1,430 feet northwest of Glenwood Ave. | 2011 | 1,520 |
| V.2 Road (Winter Flats Road) | 410 feet west of V 2/10 Road | 2012 | 91 |
| 45.5 Road (De Beque Cutoff) | 900 feet north of U Road | 2011 | 907 |
| 44 Road[2] | 1,500 feet northeast of V.2 Road | 2007 | 262 |
| 4th Street[2] | 136 feet west of 45 Road | 2006 | 1,455 |

[1] White, 2012.
[2] Town of De Beque, 2009.

The Colorado Department of Transportation (CDOT) maintains Interstate-70. Mesa and Garfield counties are responsible for maintaining county roads within their borders. The Town of De Beque maintains town streets. Mesa County Road 45 and Garfield County Road 204 (Roan Creek Road) are primary snow plow routes. Secondary snow plow routes include Mesa County Road 44 and V.2 Road and Garfield County roads 200 and 222.

### 3.4.7.2 Environmental Consequences

**Proposed Action Alternative**

The Proposed Action could have direct impacts on transportation in the vicinity of and within the project area by increasing traffic volumes; and have indirect impacts through increasing opportunities for vehicle collisions with wildlife and other vehicles and contributing to roadway deterioration and dust creation on unpaved roads. The majority of these impacts would occur during the project's 3 year construction phase, when project-related traffic levels would be highest.

Based on the assumptions and traffic estimates described in Section 2.2.1.4, project-related traffic would peak at 81 vehicle round-trips per day. This traffic level would occur with one drilling rig under mobilization or demobilization and one drilling rig and one completion rig in operation. Peak traffic without mobilization of a drilling rig would include 42 vehicle round-trips per day, when two drilling rigs and one completion rig would be in operation. These peak project-related traffic volumes would have an imperceptible impact on traffic volumes on segments of Interstate-70 between Rifle and Grand Junction.

Peak project-related traffic on Mesa County 45 Road would occur with one drilling rig being mobilized and one drilling rig and one completion rig in operation in the Homer Deep Unit. Peak project traffic would occur for 60 days over the project's construction phase and could result in an 11 percent increase in traffic on Mesa County 45 Road compared to 2011 traffic levels. Peak project traffic without mobilization of a drilling rig could result in a 6 percent increase in traffic on Mesa County 45 Road compared to 2011 traffic levels.

Peak project-related traffic on Mesa County 45.5 Road would occur with one drilling rig under mobilization and one drilling rig and one completion rig in operation in the Horseshoe Canyon Unit. Peak project traffic would occur for 48 days during the project's construction phase and could result in an 18 percent increase in traffic on Mesa County 45.5 Road compared to 2011 traffic levels. Peak project traffic without mobilization of a drilling rig could result in a 9 percent increase in traffic on Mesa County 45.5 Road compared to 2011 traffic levels.

Peak project-related traffic on 4$^{th}$ Street and Mesa County 44 and V.2 roads would occur with one drilling rig under mobilization and one drilling rig and one completion rig in operation in the Winter Flats Unit and Wagon Track Non-Unitized Area. Project traffic would peak for 36 days during the construction phase and could result in a 10 percent increase in traffic on 4$^{th}$ Street compared to 2006 traffic levels, a 53 percent increase in traffic on Mesa County 44 Road compared to 2007 traffic levels and a 154 percent increase in traffic on Mesa County V.2 Road compared to 2012 traffic levels. Peak project traffic without mobilization of a drilling rig could result in a 4 percent increase in traffic on 4$^{th}$ Street compared to 2006 traffic levels, a 24 percent increase in traffic on Mesa County 44 Road compared to 2007 levels and a 70 percent increase in traffic on Mesa County V.2 Road compared to 2012 traffic levels.

Upon completion of all construction, production traffic associated with the Proposed Action would fall to four vehicle round-trips per day. Production-related traffic would result in an imperceptible change in traffic volumes on Interstate-70, less than a 1 percent increase in traffic on 4$^{th}$ Street and Mesa County 45 and 45.5 roads, a 2 percent increase on Mesa County 44 Road and a 9 percent increase in traffic on Mesa County V.2 Road.

**Protective/Mitigation Measures**

The following measures are included as design features in Black Hills proposal to minimize impacts to Transportation:

- A produced water gathering system would be installed, reducing heavy truck traffic.
- Existing roads would be used as much as possible, with gathering pipelines installed alongside existing and new roads, to minimize disturbance.
- Workers would carpool to drilling locations when feasible.
- Remote telemetry would be used to report well conditions, rather than sending an employee, wherever possible.
- Produced water would be injected into project area disposal wells, reducing the need for heavy truck traffic to haul produced water out of the project area.
- A pipeline system for water delivery would reduce heavy truck trips to deliver water.
- Employees and contractors would follow all posted speed limits or keep speeds below 20 miles per hour on unpaved roads, to reduce dust and road damage.

The following BLM GJFO Standard COAs would help minimize impacts to Transportation:

- Roads will be crowned or sloped, drained with ditches, culverts and/or water dips, and constructed, sized and surfaced in compliance with BLM Gold Book standards (pp. 24-28). Water outlets such as turn-outs and culverts, will incorporate BMPs like rip-rap, sediment catchments and anchored check structures which slow water velocity, to prevent erosion and sediment transport. If applicable, initial gravel application will be to a minimum depth of 3 inches.
- When saturated soil conditions exist on access roads or location, or rutting deepens to 3 inches, construction and travel will be halted until soil material dries out, is frozen sufficiently or is otherwise brought to standards appropriate for resource protection and road construction. Use will not proceed under conditions of undue damage and erosion to soils, roads and/or locations. All drainage ditches and culverts will be kept clear and free-flowing, and be maintained in good condition.
- Where roads are located near drainages, vegetated buffer strips will be left between areas of disturbance and drainages.
- The operator will provide timely maintenance of roads. A regular schedule for maintenance will include, but not be limited to dust abatement, reconstruction of the crown, slope, or water dips/bars; blading or resurfacing; clean-out of ditches, culverts, catchments and other BMPs. When rutting of the travel-way deepens to 4 inches, maintenance or upgrade will be conducted as approved by the BLM.
- Roads that access active construction and drilling sites will be posted with warning signs to alert hunters and recreational vehicle users that project personnel and vehicles are in the area. Project personnel will restrict activities and travel to permitted roads and sites.
- Operator will install speed control measures on project-related unpaved roads.
- Ditches may be revegetated and/or include large rocks or other BMPs, to slow drainage velocity and settle sediment. Ditch seeding and revegetation may be required in erodible soils.

- All cut and fill slopes for roads (and well pads and related locations) will be protected against rilling and erosion with BMPs such as soil texturing and seeding or additional measures approved by the BLM. Measures may include geotextiles, weed-free straw crimping/ bales/ wattles/ matting, as needed or as detailed by storm water plan or BLM permit. BMPs will be monitored and maintained in functional condition.

**No Action Alternative**

Under this alternative, there would be no project-related impacts to transportation from construction of the Proposed Action.

### 3.4.8 Wastes, Hazardous or Solid

#### 3.4.8.1 Current Conditions

Hazardous and solid wastes are not a part of the natural environment, but could be introduced as a result of implementation of the Proposed Action, as described below.

#### 3.4.8.2 Environmental Consequences

**Proposed Action Alternative**

BLM Instruction Memoranda numbers WO-93-344 and CO-97-023 require that all NEPA documents list and describe any hazardous and/or extremely hazardous materials that would be produced, used, stored, transported, or disposed of as a result of a proposed project.

A variety of wastes would be generated during drilling, well completion and post-completion operations. Hazardous materials would also be used on site. These wastes and hazardous materials are described below.

Drill Cuttings. Drilling operations generate drill cuttings and fluids ('mud') from the well bore (mainly shale, sand and mixed rock minerals). Drilling muds may contain small concentrations of contaminants, including mercury, cadmium, arsenic and hydrocarbons, any of which could adversely affect soil and water resources if released to the environment.

Frac Water. During well completion, the typical method used for stimulating the formation to enhance the production of oil and gas consists of hydraulic fracture ('frac') treatment of the reservoir. Excess frac water would be stored in temporary tanks prior to reuse or disposal. Flowback water, frac water returning to the surface after fracturing operations, would be introduced into the fluids pit and held there for evaporation, as previously described. Frac and/or flowback water could adversely affect soil and water resources if released to the environment.

Hazardous Materials. A variety of materials typical of oil and gas development could be at the site during construction and operation including lubricants, diesel fuel, gasoline, solvents and hydraulic fluids. Hazardous materials which may be found at the site may include drilling mud and cementing products which are primarily inhalation hazards and materials that may be necessary for well completion/stimulation such as flammable or combustible substances and acids/gels (corrosives). Hazardous materials stored on site could adversely affect soil and water resources if released to the environment.

Other Solid Wastes. Other solid wastes associated with drilling and well completion would include human waste and trash. Portable, self-contained chemical toilets would be used for human waste disposal. Other solid waste could adversely affect soil and water resources if released to the environment.

Condensate and Produced Water. During post-completion operations, a separation/dehydration process is typically used to remove condensate (a liquid hydrocarbon resembling light crude oil) from the natural gas and above-ground tanks are used to contain the condensate and produced water. Condensate production is not anticipated under the Proposed Action. Produced water is typically high in salinity and typically contains some petroleum hydrocarbons and BTEX (benzene, toluene, ethyl benzene and xylene) constituents. The above-ground storage tanks would remain on site for the life of the well(s). Long-term, undetected leaks from tank batteries are a potential source of groundwater contamination. Corrosion of steel tanks over the long term is quite likely. The high salt content of the produced water would very likely contribute to this process. Condensate would be transported to market by tanker trucks. The produced water could be recycled for use in drilling and completion at other nearby wells or trucked off-site to disposal facilities. Potential releases of produced water and gas condensate could occur from tanking, piping and transport trucks. This could be the result of various types of accidents, or tank/piping failures. Spills of these substances would be covered under federal and state statutes and regulations and local and, if necessary, regional hazardous materials response plans. Effects from spills would be minimized by implementation SWMPs, BMPs, and the SPCC Plan.

Surface waters could be negatively impacted by spills of condensate, produced water, or hazardous materials stored at the pad. Testing is indicated to determine cases where contamination by petroleum hydrocarbon or BTEX concentrations in contaminated soil rise above regulatory limits. If it does, soil removal is indicated. Perhaps of greater consequence in these accidents is the potential for diesel fuel spills from ruptured fuel tanks. Diesel spills generally require removal of contaminated soils. Prompt response is necessary in the case of diesel or produced water spills to minimize negative impacts to surface/groundwater quality, plants and wildlife resources. Negative impacts would be minimized by implementation of SWMPs, BMPs and the SPCC Plan.

The possibility exists that regulated hazardous materials unrelated to the gas production process could be legally introduced to the produced water, resulting in inadvertent illegal disposal along with the water. While there is no evidence to suggest this is a common occurrence, it could result in contamination of subsurface resources by the introduction of such regulated substances. It also could result in the contamination of groundwater resources, should there be a spill or leak at the tank battery.

Design features and standard conditions of approval have been developed to mitigate the above hazards (see below). With adherence to these requirements and prompt response in the event of a release of hazardous materials, impacts can be quickly and effectively remediated.

**Protective/Mitigation Measures**

The proposal includes the following to minimize impacts from solid and hazardous wastes:

- Black Hills would implement SWMPs, BMPs, and the SPCC Plan.
- Bear-resistant containers would be used. Refuse would be collected frequently to minimize potential for conflicts with bears.

The following BLM GJFO Standard COAs would help minimize impacts from solid and hazardous wastes:

- Substances specifically listed as hazardous waste or demonstrating character of a hazardous waste (40 CFR 261) will not be used in drilling, testing, or completion operations, nor introduced at any time into the reserve or cuttings pit.
- The operator will prevent all hazardous, poisonous, flammable and toxic substances from contacting soil and/or water. At a minimum, the operator will install and maintain an impervious secondary containment system for any tank or barrel containing hazardous, poisonous, flammable or toxic substances. Containment will be sufficient to contain 110% of the contents as well as any drips, leaks and anticipated precipitation.
- All installed production facilities (storage tanks, load outs, separators, treating units, etc.) with the potential to leak or spill oil, condensate, produced water, glycol, or other fluid which could be a hazard to public health or safety will be placed within appropriate impervious secondary containment structure that will hold 110% of the capacity of the largest single container within it for 72 hours.
- Chemical containers will be clearly labeled, maintained in good condition and placed within secondary containment. They will not be stored on bare ground, nor exposed to sun and moisture.
- Any release of toxic substances (leaks, spills, etc.) in excess of the reportable quantity established by 40 CFR, Part 117 will be reported per the Comprehensive Environmental Response Compensation and Liability Act of 1980, Section 102b (CERCLA). Copies of any report to any federal agency or state government as a result of a reportable release/ spill of any toxic substances will be furnished to the BLM, concurrent with the filing of the reports to any federal agency or state government.
- The operator will dispose of any fluids that collect in the containment system which do not meet applicable State or EPA livestock water standards, per State law and in a manner so that fluids do not drain to the soil or ground.
- All secondary containment systems will be designed, constructed, and maintained to prevent wildlife and livestock exposure to harmful substances. The operator will install effective wildlife and livestock exclosure systems like fencing, netting, expanded metal mesh, lids and grate covers.

The BLM has identified the following additional measures:

- The BLM, CDPHE Water Quality Control Division and CPW should be contacted immediately if a reportable spill occurs.
- Spill station locations should be established and placed in strategic locations.

**No Action Alternative**

Under this alternative, there would be no additional exploration. Natural gas production, with attendant concerns, would continue to occur from existing wells.

## 3.5 LAND RESOURCES

### 3.5.1 Prime or Unique Farmlands

#### 3.5.1.1 Current Conditions

Prime farmland soils are designated by the U.S. Department of Agriculture (USDA) and are soils that have the best combination of physical and chemical characteristics for producing food, feed, forage, fiber and oilseed crops and that are also available for these uses. In the project area, three soil mapping units are designated prime farmland soils, if irrigated. These three mapping units include: Mapping Unit 32 (Dominguez clay loam), Mapping Unit 54 (Panitchen loam) and Mapping unit 78 (Youngston loam).

#### 3.5.1.2 Environmental Consequences

**Proposed Action Alternative**

The Proposed Action would affect a total of 38.70 acres of such prime farmland soils (with 10 acre well pads; however, well pads would not exceed 6.8 acres under the Proposed Action). About 6.4 acres of these soils are in agricultural production (improved pasture or hay) within Mapping Unit 54 (Panitchen loam) and would be affected in the long-term. This disturbance is associated with HSC CF#3 proposed on private lands adjacent to the Colorado River in the Horseshoe Canyon Unit. Implementation of SWMPs, BMPs and SPCC Plans could minimize the potential for spills and contamination of soils that could potentially affect soil productivity adjacent to this facility.

**Protective/Mitigation Measures**

These measures are included in the proposal, to minimize to minimize impacts to prime/unique farmlands:

- Implementation of SWMPs, BMPs and SPCC Plans helps minimize spills and soil contamination that could potentially affect soil productivity adjacent to pad HSC CF#3.

The BLM has not identified any additional protective/mitigation measures to further reduce potential impacts to prime farmlands.

**No Action Alternative**

Under the No Action Alternative, construction and operation of the Proposed Action would not occur. Any existing potential and future impacts to prime farmlands from other uses on private lands would continue.

### 3.5.2 Recreation

#### 3.5.2.1 Current Conditions

The project area is located mostly in an area valued for rugged, scenic terrain. BLM has not developed recreational facilities, such as campgrounds or picnic areas, within the project area.

BLM-administered lands within the project area are not designated as recreation management areas under the 1987 RMP and management there is limited to custodial actions.

Much of the region provides visitors with opportunities for varied forms of dispersed recreation in solitude, surrounded by large expanses of undeveloped land. Hunting, off-highway vehicle use, mountain biking, camping, fishing and scenic touring are the primary recreational uses in the project area. These uses occur on BLM-administered and private lands, for the most part within the Homer Deep Unit, which lies north of South Shale Ridge. Multiple area ranchers and outfitters operate recreation-based businesses that host activities within the project area. Such

activities include hunting, fishing, horseback riding/ dude-ranching, lodging, banquets and other events. Scenic auto-touring occurs throughout the project area as well.

As noted in the guidebook Colorado Byways: Backcountry Drives for the Whole Family (Huegel, 2003), one relatively popular car-travel day trip in the area is for visitors to make a loop around the South Shale Ridge land mass, typically approaching from the De Beque area by either the Winter Flats Road (Mesa County Road V.2), or the Dry Fork Road (Mesa County Road X.5).

Additionally, recreationists use roads branching south off Mesa County V.2 Road to access the Little Book Cliffs Wilderness Study Area (WSA) and Little Book Cliffs Wild Horse Range (WHR), which overlap each other. These areas contain several established trails for hiking, sight-seeing, off-highway vehicle use and horseback riding.

Within the past 6 years, the Wagon Track/Castle Rock area accessed by Mesa County Road V.2, a project area boundary has become popular for its single track motorcycle and mountain bike riding opportunities. The BLM is currently working with partner organizations to develop a recreation management strategy in that area.

The GJFO manages six Special Recreation Permits (SRPs) for big game hunting and five SRPs for mountain lion hunting in the area. The following outfitters are authorized to operate in the project area: Alameno Outfitters, Backcountry Outfitters, Bear Paw Outfitters, Cat Track Outfitters, High Lonesome Lodge, Keys Guide and Outfitting, Little Creek Ranch, Mark Davies Outfitters, Meadows Vega Outfitters, Prather Outfitters and Roosters Guide and Outfitting Adventures. The Town of De Beque's annual Wild Horse Days is also a BLM-permitted event.

Most of the project area is located in the Game Management Unit designated by CPW as GMU 31, in Mesa and Garfield counties. Black Hills' exploration within the Horseshoe Canyon Unit would be located in GMU 42, in Mesa County. A sliver of GMU 30 lies within the western edge of the Winter Flats Unit. Substantial numbers of hunters spend time pursuing mule deer and elk within GMU 31. In 2011 for example, 546 mule deer hunters each spent on average 5.1 days and 1,033 elk hunters spent 4.4 recreation days hunting in GMU 31. In GMU 42, 1,620 mule deer hunters each spent on average 4.4 days and 3,038 elk hunters spent 5 recreation days pursuing game there.

For GMUs 31 and 42, the 2012 archery season for deer and elk ran August 23 through September 23, the muzzle loading rifle season ran from September 8 through September 16 and multiple rifle combined deer/elk seasons were scheduled for October 13 through November 18 in 2012.

Because of the limited size and relatively rugged terrain of the portion of GMU 30 that coincides with the Winter Flats part of the project area, hunting figures for the unit are not included here.

#### 3.5.2.2 Environmental Consequences

**Proposed Action Alternative**

Impacts to recreation could result from increased light and heavy vehicle traffic on area roads, human activity, noise, night-time lighting and dust. Construction and production activities could displace game species in some areas, depending on levels of human activities as well as forage and cover opportunities. The site proposed for exploration activities are scattered throughout a region containing existing oil and gas development. Because existing and proposed well pads and other facilities are relatively dispersed, impacts to hunting, dude-ranching, outfitting, fishing, and other dispersed recreation during construction and drilling may be seasonal and/or relatively short-term.

Indirect impacts to area recreationists would be temporary and could include diminished hunting and wildlife viewing opportunities due to potential wildlife displacement caused by oil and gas

operations. Alternative design features of the aforementioned well pads could reduce noise and visual impacts to dude ranches and outfitters. Specifically, increased noise and light mitigation measures during drilling operations would likely help manage temporary impacts that could occur at the High Lonesome Ranch Headquarters, which is located about 2,000 feet from Black Hills' proposed pad HDU 7-23.

Car-travel recreationists day-tripping around South Shale Ridge and/or seeking access to the Goblins Area, Little Book Cliffs WSA, or WHR could encounter more trucks and heavy equipment traffic on Garfield County roads 200 and 222, and Mesa County X.5, O.9, V.6 and V.2 roads. In some cases, these encounters might result in slower, dustier, rougher traveling situation for recreationists. Proposed measures to reduce traffic (carpooling, water gathering systems, remote telemetry) and fugitive dust would also reduce such impacts to recreationists.

Over the life of the Proposed Action, natural gas wells, equipment and facilities could alter the general solitude and scenic values of the area. These values currently exist as important attributes to quality recreational experiences. Industrial activity would concentrate around well pads, roads and centralized facilities. The amount of surface disturbance attributed to well pads would be reduced by interim reclamation, required at all federally permitted well pads. Interim reclamation should reduce the disturbed area at each well pad by several acres including some rebuilding of natural topographic contours, and reestablish natural vegetation.

Recreation opportunities would be most impeded by the Proposed Action, during construction and drilling. Traffic and surface disturbance would diminish considerably when construction, drilling and well completions had finished and the wells had gone into production status. However, should the wells prove productive and profitable, further drilling on these pads could reasonably be expected, lengthening the period of more intense impacts to recreation opportunities. With the dispersed character of both the recreation types and the Proposed Action itself, overall impacts may not be adverse.

**Protective/Mitigation Measures**

The following measure is included in Black Hills' proposal, to minimize impacts to recreation:

- Traffic reduction measures discussed in Section 3.4.7.2, Transportation, would also minimize impacts to recreation.

The BLM would require the following standard and project-specific measures to help mitigate impacts to recreation that could occur under the Proposed Action:

- Warning signs should be posted on access roads to alert recreationists and project personnel to each other's presence and to help avoid accidents.
- Construction timing should be coordinated with area outfitters and landowners to avoid conflicts with users of dispersed recreation sites and to mitigate impacts to them.
- See Section 3.2.5.2 for measures to reduce impacts from noise.
- See Section 3.4.4.2 for measures to reduce visual impacts to recreationists.

**No Action Alternative**

Under this alternative, the Proposed Action would not be constructed or operated. Existing recreational uses would continue in the project area without increased traffic due to the Proposed Action.

### 3.5.3 Special Designations (ACECs, SMAs, etc.)

#### 3.5.3.1 Current Conditions

Areas of special designations relevant to the Proposed Action include Areas of Critical Environmental Concern (ACEC). The Pyramid Rock ACEC is an area designated for the conservation of rare plants. It is partially located in the northeast corner of the Wagon Track Non-Unitized Area and bordered by Mesa County V.2 Road, which would serve as an access road for the Proposed Action.

#### 3.5.3.2 Environmental Consequences

**Proposed Action Alternative**

The Pyramid Rock ACEC would not be impacted by surface disturbance under the Proposed Action. Fugitive dust and erosion caused by increased traffic on Mesa County V.2 Road could potentially impact rare plants found in the ACEC. Measures to reduce vehicular traffic (carpooling, water gathering lines, remote telemetry) and resulting dust (control of speeds and watering) could help to minimize potential effects to the rare plants in the ACEC and effects could be minimal (see Section 3.3.5, Special Status Plant Species).

**Protective/Mitigation Measures**

None.

**No Action Alternative**

Under this alternative, proposed well pad WF 10-31-99 would not be constructed and resulting additional traffic would not occur. Existing traffic accessing well pads in the Winter Flats area would continue to potentially impact rare plants in the ACEC through fugitive dust and uncontrolled speed.

### 3.5.4 Wild and Scenic Rivers

#### 3.5.4.1 Current Conditions

The Wild and Scenic Rivers Act of 1968 established legislation for a National Wild and Scenic Rivers System to protect and preserve designated rivers in their free-flowing condition and their immediate environments. At the time of preparation of this EA, the BLM GJFO area contains no designated Wild and Scenic Rivers (WSR). However, in preparation for an RMP revision, WSR eligibility studies were conducted by the GJFO in 2009 for streams within the planning area (BLM, 2009b).

A total of 20 stream segments are currently being managed administratively as eligible by the GJFO through stipulations, allowable uses and/or management actions that protect the identified Outstanding Remarkable Values (scenic, recreational, geologic, fish and wildlife, historic, cultural, or other). Only Congress can designate rivers and streams for inclusion into the WSR preservation system.

Two segments of the Colorado River in DeBeque Canyon are considered eligible for Wild and Scenic status because of their recreational values (BLM, 2009b). Segment 1 runs through the project area near the Wagon Track Non-Unitized Area and along the boundaries of the Horseshoe Canyon Unit. Segment 2 is downstream from the project area and the Grand Valley Diversion Dam. Interstate-70 and a railroad line run parallel to the river along these segments and are visible from them.

#### 3.5.4.2 Environmental Consequences

**Proposed Action Alternative**

The Proposed Action would not impact recreational values of eligible Segments 1 and 2 of the Colorado River which course through an area with deep canyon walls. Much of the proposed exploration would be located on the mesas and ridges above DeBeque Canyon out of sight of recreational river users. Measures proposed to reduce traffic (carpooling, water gathering lines, remote telemetry) and control fugitive dust (speed limits and watering) should help protect visual resources which are important to recreational river users.

**Protective/Mitigation Measures**

None.

**No Action Alternative**

Under the No Action Alternative, the proposed exploration project would not be constructed and operated. Existing river uses would continue without any potential effects from the Proposed Action.

### 3.5.5 Wilderness and Lands with Wilderness Characteristics

#### 3.5.5.1 Current Conditions

Congress passed the Wilderness Act in 1964, establishing a national system of lands for the purpose of preserving ecosystems in their natural condition for benefit of future generations. With the passage of the FLPMA in 1976, Congress directed the BLM to inventory, study and recommend which public lands under its administration should be designated as wilderness. Only Congress has the authority to add areas to the National Wilderness Preservation System.

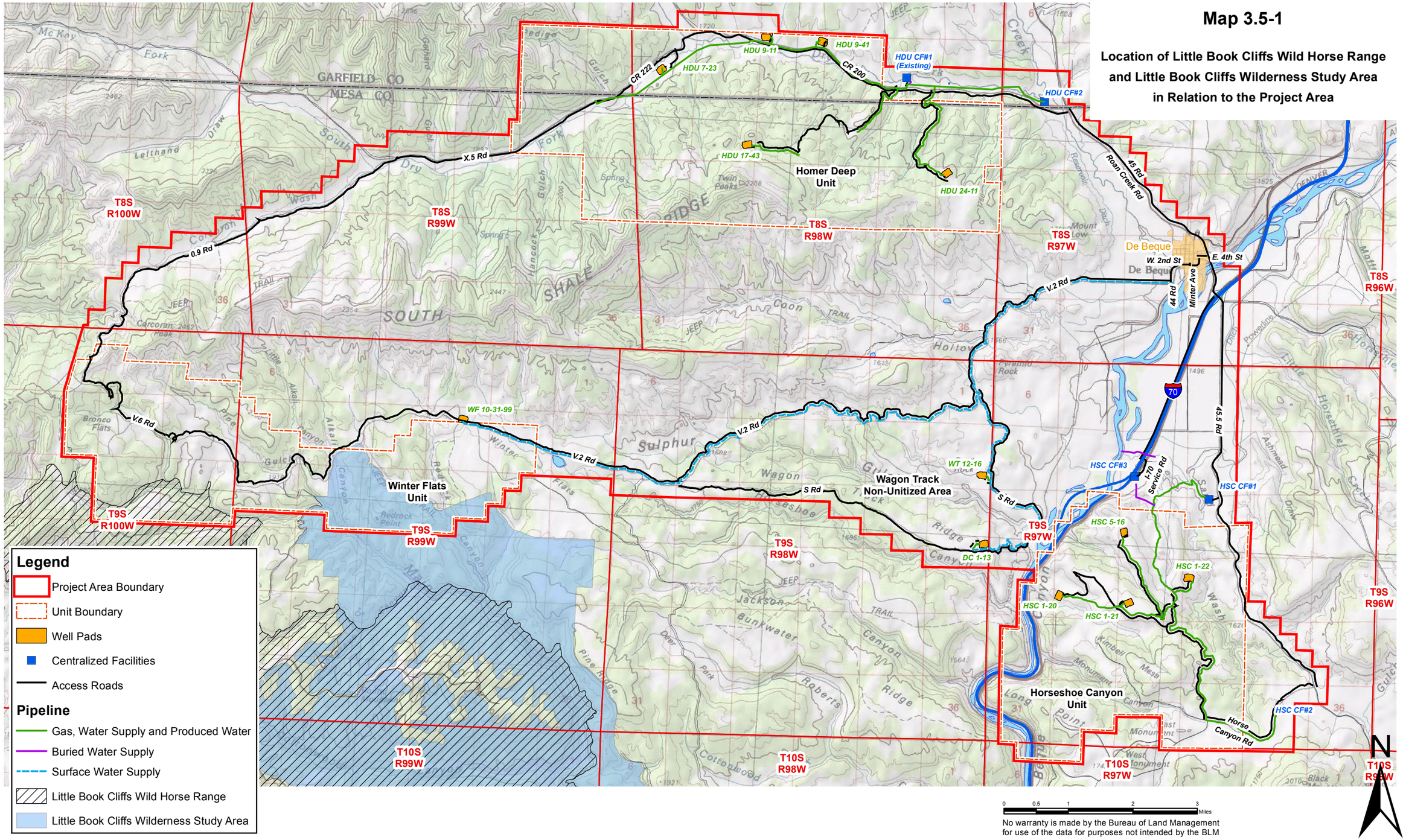
During the 1980s and ‘90s, the BLM conducted a 15-year wilderness study process on all public lands to identify lands with wilderness characteristics resulting in several areas being recommended for designation. The closest Congressionally-designated wilderness area to the project area is the Black Ridge Canyons Wilderness Area west of Grand Junction.

On BLM-administered lands, a Wilderness Study Area (WSA) is a roadless area that has been surveyed and found to have wilderness characteristics, but has not yet been designated by Congress. Until Congress acts, such WSAs are managed to ensure that wilderness values remain intact. The Winter Flats Unit boundary partially coincides with the Little Book Cliffs WSA as shown on Map 3.5-1. The WSA consists of 26,525 acres. It is characterized by gently sloping plateaus dissected by four major canyon systems (Main, Coal, Cottonwood and Spring), with numerous side canyons. Excellent opportunities exist there for solitude and unconfined recreation. The topographic diversity, the presence of wild horse herds and outstanding scenic qualities all offer photographic opportunities as well.

In July of 2012, the BLM GJFO released its Wilderness Characteristics Inventory Update which documents the wilderness inventory of 31 parcels of GJFO-managed lands. Twelve of those parcels were identified as having wilderness character, including South Shale Ridge Wilderness Character Inventory Unit (WCIU 26) which partially coincides with three of the exploration areas, and Hunter Canyon (WCIU 13) which lies along the western boundary just west of the Winter Flats Unit.

## Map 3.5-1

**Location of Little Book Cliffs Wild Horse Range and Little Book Cliffs Wilderness Study Area in Relation to the Project Area**



Mesa County V.2 Road (Winter Flats Road) runs generally along the southern boundary of South Shale Ridge. Mesa County O.9 Road (Corcoran Wash Road) generally wraps around the western end of South Shale Ridge, forming part of the BH DEP project boundary that coincides with that of the South Shale Ridge Wilderness Character Inventory Unit (WCIU 26), and with that of the Hunter Canyon Wilderness Character Inventory Unit (WCIU 13) to the west.

Well pad HDU 24-11 is proposed just north/outside of the South Shale Ridge WCIU boundary. It would be accessed by an existing dirt road on BLM-administered lands that was built to serve another well pad built in the vicinity. Well pad WF 10-31-99 is proposed south/outside of the South Shale Ridge WCIU, adjacent to and accessed by Mesa County V.2 Road.

#### 3.5.5.2 Environmental Consequences

**Proposed Action Alternative**

The Little Book Cliffs WSA, which lies partially within the project boundary, would not be directly impacted by surface disturbance under the Proposed Action. Although the project area boundary overlaps the WSA boundary, no well pads, roads, pipelines, or other facilities that would cause surface disturbance are proposed or reasonably foreseen within the Little Book Cliffs WSA, the Hunter Canyon WCIU or the South Shale Ridge WCIU. However, proposed developments would introduce visual and sound impacts in close proximity to these units, which would indirectly affect naturalness within them.

**Protective/Mitigation Measures**

None.

**No Action Alternative**

Under the No Action Alternative, the Proposed Action would not be constructed and operated. There would be no impacts to WSAs or to lands with wilderness characteristics. Current uses would continue.

### 3.5.6 Range Management

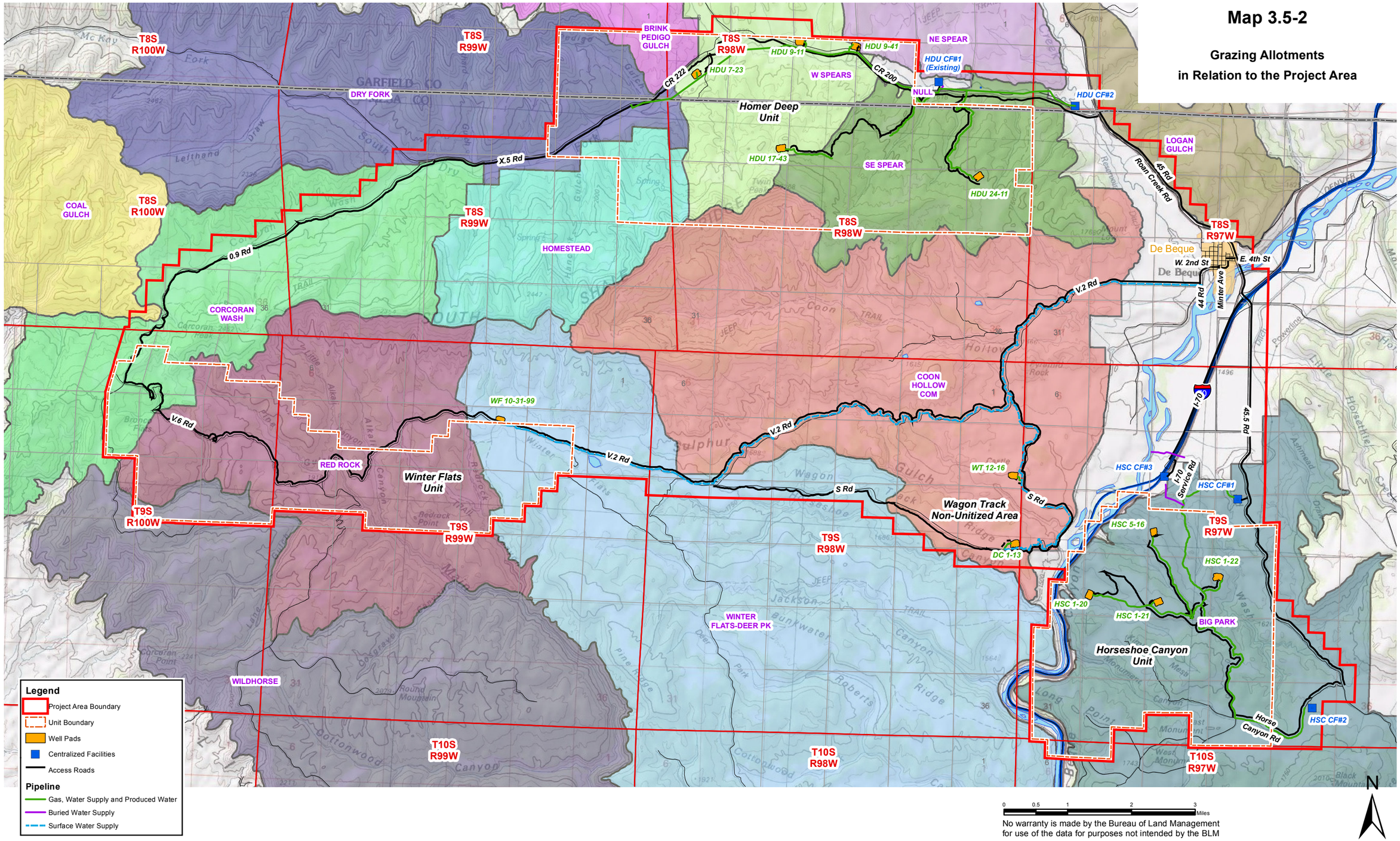
#### 3.5.6.1 Current Conditions

The project area boundary coincides with parts of 13 BLM livestock grazing allotments and one wild horse allotment managed by the GJFO, as shown on Map 3.5-2. These include the Red Rock, Winter Flats-Deer Park, Coal Gulch, Corcoran Wash, Southeast Spear, Northeast Spear, West Spears, Dry Fork, Logan Gulch, Coon Hollow, Homestead, Brink Pedigo Gulch and Big Park allotments. The Wildhorse allotment (6799) is the same as the Little Book Cliffs Wild Horse Range described in Section 3.5-9, below. Cattle grazing is not permitted there. The 13 grazing allotments total 174,710 acres, 70,686 of which are in the project area. A total of 5,681 animal unit months (AUMs) are currently permitted for the allotments. Table 3.5-1 summarizes the use, AUMs and size of each of the allotments. The Coon Hollow (6712) and Winter Flats-Deer Park (6713) allotments are both slated to have AUM reductions pending approval. Currently, with the exception of the Wildhorse allotment, all of the allotments are used to graze and/or trail cattle. The BLM grazing allotments encompass both public and private lands, but only public lands are included in determining active AUMs.

There are several range improvements on grazing allotments within the project area. These include fences, stock ponds, reservoirs, cattle trails, cattle guards, pipelines, vegetation treatments and retention dams. In the eastern portion of the Winter Flats area (Winter Flats-Deer Park allotment), existing range improvements provide critical water sources for wildlife and livestock.

## Map 3.5-2

**Grazing Allotments in Relation to the Project Area**




No warranty is made by the Bureau of Land Management for use of the data for purposes not intended by the BLM

**Table 3.5-1**
**BLM Cattle Grazing Allotments Coinciding with the Project Area[1]**

| Allotment | Total Allotment Acreage | Allotment Acreage within BHDEP Area | AUMs | Period of Use |
|---|---|---|---|---|
| Red Rock (6745) | 12,421 | 9,059 | 371 | 10/01—11/30 |
| Coal Gulch (16502) | 23,688 | 43 | 303 | 6/1—10/1 |
| Winter Flats-Deer Park (6713) | 34,136 | 6,089 | 200 | 4/15—6/10 |
| | | | 375 | 11/15—1/28 |
| Corcoran Wash (6704) | 11,324 | 6,717 | 490 | 5/01—6/15 |
| | | | 820 | 10/16—12/31 |
| Southeast Spears (6739) | 6,500 | 6,492 | 193 | 4/16—5/31 |
| | | | 127 | 11/01—12/15 |
| Northeast Spears (6718) | 7,760 | 313 | 172 | 4/16—5/15 |
| | | | 217 | 11/16—2/15 |
| West Spears (6753) | 7280 | 4,135 | 323 | 5/01—6/13 |
| | | | 148 | 11/01—12/15 |
| Dry Fork (6715) | 14,152 | 2,423 | 375 | 3/01—9/30 |
| | | | 189 | 11/20—12/30 |
| Logan Gulch (6733) | 3,891 | 325 | 97 | 5/5/1—5/31 |
| Coon Hollow (6712) | 20,261 | 20,139 | 200 | 4/14—6/10 |
| Homestead (6740) | 5,303 | 5,303 | 211 | 5/10—7/01 |
| Brink Pedigo Gulch (6703) | 8,243 | 511 | 71 | 4/26—6/25 |
| | | | 40 | 11/20—12/30 |
| Big Park (6843) | 19,751 | 9,137 | 759 | 4/15—6/10 |
| **Totals** | **174,710** | **70,686** | **5,681** | — |

[1] Acreage based on BLM GIS data and are rounded up to the nearest acre. The Wildhorse allotment is not included because the BLM does not allow cattle grazing there.

### 3.5.6.2 Environmental Consequences

**Proposed Action Alternative**

Impacts to grazing resources under the Proposed Action would take place mostly in the form of forage removal. Surface disturbance would occur across ten grazing allotments. BLM-permitted cattle grazing would continue throughout the duration of the Proposed Action. Approximately 273.7 acres within seven of the 13 coinciding grazing allotments are proposed to be disturbed by Black Hills' activities as shown in Table 3.5-2 (with 10 acre well pads; however, well pads would not exceed 6.8 acres under the Proposed Action). Approximately 212.7 of these acres would be revegetated after construction.

**Table 3.5-2**
**Potential Impacts to BLM Grazing Allotments in the Project Area**

| Allotment | Total Proposed Surface Disturbance (acres) |
|---|---|
| Coon Hollow (6712) | 20.62 |
| Winter Flats-Deer Park (6713) | 10.20 |
| Dry Fork (6715) | 4.92 |
| Northeast Spears (6718) | 4.87 |
| Southeast Spears (6739) | 43.73 |
| West Spears (6753) | 64.70 |
| Big Park (6843) | 124.67 |
| **Totals** | **273.71** |

Most of the range improvements in the project area would be avoided by the Proposed Action. Construction of proposed well pad WF 10-31-99 would not impact the existing range improvements (Soap Reservoir, stock ponds, fences, etc.) in the Winter Flats area. Project access roads would pass near several stock ponds and cross some cattle guards. Proposed well pad HDU 9-41 would coincide with the boundary of the West Spears and Northeast Spears allotments, along with the allotment boundary fence.

If reclamation was successful and reclaimed areas were excluded from livestock grazing, grasses and forbs could provide vegetative cover and forage as soon as 2 to 3 years after reclamation. The Wildhorse allotment would not be impacted by the Proposed Action.

In addition to the loss of forage, increased vehicle traffic would increase the risk of injury or death to grazing cattle in the project area but could be mitigated by proposed traffic reduction BMPs (carpooling, water gathering pipelines, remote telemetry) and to limit driving speeds. In accordance with the BLM GJFO Standard COAs, damage to range improvements (fences, gates, reservoirs, pipelines, etc.) would be avoided, but if they were damaged, Black Hills would immediately repair or replace them. Where an access road bisects an existing livestock fence, a steel frame gate or a cattle-guard with a bypass gate would be installed across the roadway. All of these measures should reduce potential impacts to range management and overall, impacts could be minimal.

**Protective/Mitigation Measures**

The following BLM GJFO Standard COAs would be required, to minimize impacts to range resources:

- Damage to range improvements (fences, gates, reservoirs, pipelines, etc.) will be avoided, but if they are damaged, the Black Hills will immediately repair or replace them. Where an access road bisects an existing livestock fence, a steel frame gate or a cattle-guard with a bypass gate will be installed across the roadway.
- Within 30 days of completion of pad construction, topsoil storage berms, storm water control features, temporarily disturbed areas along roads and pipelines, and cut and fill slopes will undergo temporary seeding to stabilize materials, maintain biotic soil activities, and minimize weed infestations.
- Within 6 months following completion of the last well planned on a pad, or after a year has passed with no new wells drilled, interim reclamation (IR) will be completed to reduce the well pad to the smallest size needed for production. IR will include earthwork, seeding and BMPs.

The BLM would also require the following to help minimize impacts to range resources:

- Planned activities should be coordinated with affected grazing permit holders.
- Suitable fencing should be installed (in consultation with BLM wildlife and range staff) to avoid over-grazing and to support successful reclamation. Salt licks and water tanks, which encourage animal congregation, should be placed away from revegetated disturbance.
- Livestock owners should be reimbursed for loss or damage to livestock resulting from the Proposed Action.
- The grazing allotment boundary fence line coinciding with proposed well Pad HDU 9-41 should be realigned and rebuilt to go around the well pad.

**No Action Alternative**

Under the No Action Alternative, the Proposed Action would not occur. Grazing would continue in all the allotments and no project-related impacts to grazing from construction of the Proposed Action would occur.

### 3.5.7 Forest Management

#### 3.5.7.1 Current Conditions

The project area contains forest lands on higher elevation bluffs, draws and ridgelines. Pinyon-juniper is the major forest type represented in the project area, with many stands at or approaching maturity. Pockets of ponderosa pine are located in draws and on steep terrain in the western end of the area. Deciduous/gambel oak and cottonwood are also present. Pinyon-Juniper Woodlands consist of lands dominated by pinyon-juniper and can provide fuelwood harvest. The GJFO Round Mountain Tree Cutting Area (TCA), used mostly for Christmas tree cutting, encompasses most of the Winter Flats Unit. A number few permits are issued in the 6,223-acre area each year.

#### 3.5.7.2 Environmental Consequences

**Proposed Action Alternative**

Clearing and grading for well pads, road, gathering lines and centralized facilities would directly impact forest and woodlands n the project area. Impact potential would be greatest during the construction phases when trees would be removed. The potential for soil erosion increases with tree removal, especially at sites where tree density and canopy cover have naturally decreased understory plant components. The increase in bare ground, with corresponding potential erosion increase, would need to be offset by use of erosion BMPs during construction and operation. Successful reclamation would be the most effective way to mitigate impacts.

Approximately 18.83 acres of forest and woodland species would be removed during construction, including pinyon pine, juniper and Gambel oak (with 10 acre well pads; however, well pads would not exceed 6.8 acres under the Proposed Action). The Proposed Action would impact approximately 23.9 acres of the Round Mountain Tree Cutting Area. See Table 3.3-2 in Section 3.3.2 (Vegetation) for a detailed breakdown of impacted forest and woodland acreage.

Forest resources in the project area vary in age, density and composition and are not considered suitable for commercial use. Permitted use for firewood and Christmas tree cutting is relatively low for the area and impacts to Forest Management would likely be minimal.

**Protective/Mitigation Measures**

The BLM would require the following measures to mitigate potential impacts to forest resources:

- A wood-cutting permit should be purchased from the BLM prior to clearing timbered areas. No removal of trees or brush-hogging would be approved without a permit; no tree cutting or removal is permitted during surveying operations.
- When not shredded and salvaged with topsoil, woody materials 4+ inches in diameter should be cut into sections not to exceed 4 feet in length. These may be replaced following reclamation or placed near the harvest area to be removed by individuals with BLM harvest permits.

**No Action Alternative**

Under this alternative, no project-related impacts to forest resources on BLM-administered lands would occur from construction of the Proposed Action. Existing uses in the TCA would continue.

### 3.5.8 Fire and Fuels

#### 3.5.8.1 Current Conditions

The GJFO manages wildland fire using a multidisciplinary approach under the guidelines found in two sets of interagency frameworks: the broader, directive Guidance for Implementation of Federal Wildland Fire Management Policy (Fire Executive Council, 2009) and the regional GJFO/Colorado National Monument Interagency Fire Management Plan (IFMP) (BLM, 2008b). GJFO wildland fire and fuels management reflects a consideration of fire history, land status, public concerns and issues and other resource objectives (BLM, 2008b).

Existing and previously disturbed lands are common within Fire Management Units (FMUs) in the project area. This surface disturbance includes roads, well pads, pipelines, residential areas, agricultural lands, rail lines and reclaimed areas. In June 2012, the Pine Ridge Fire blazed through a large portion of the project area (see Map 3.5-3). The fire burned for 9 days through nearly 14,000 acres, mostly on BLM-administered lands. Fuels included grass, sagebrush, Pinyon-Juniper and other timberlands.

The Proposed Action occupies three IFMP FMUs categorized as B, C and D areas.

- Category B: areas where unplanned wildland fire is not desired because of current resource conditions and fire suppression is usually aggressive. Fire and non-fire fuels treatments are utilized as the major mitigating techniques to reduce potential effects of unplanned fire.
- Category C: areas where wildland fire is desired, but significant ecological, social, or political constraints must be considered for its use. Fire and non-fire fuels treatments may be utilized to meet constraints, or to reduce hazardous effects of unplanned fire.
- Category D: areas where wildland fire is desired and there are few or no constraints for its use. There is less need for hazard fuel treatment in Category D FMUs. Prescribed fire for fuel hazard reduction is not a priority except where there is an immediate threat to public health and safety.

Generally, fire plays a natural role in the ecosystem in Category B and C FMUs, but unplanned fire could have a negative effect on certain resources (e.g., sagebrush ecosystems, air quality, wildlife), or be constrained by social issues (BLM, 2008b).

#### 3.5.8.2 Environmental Consequences

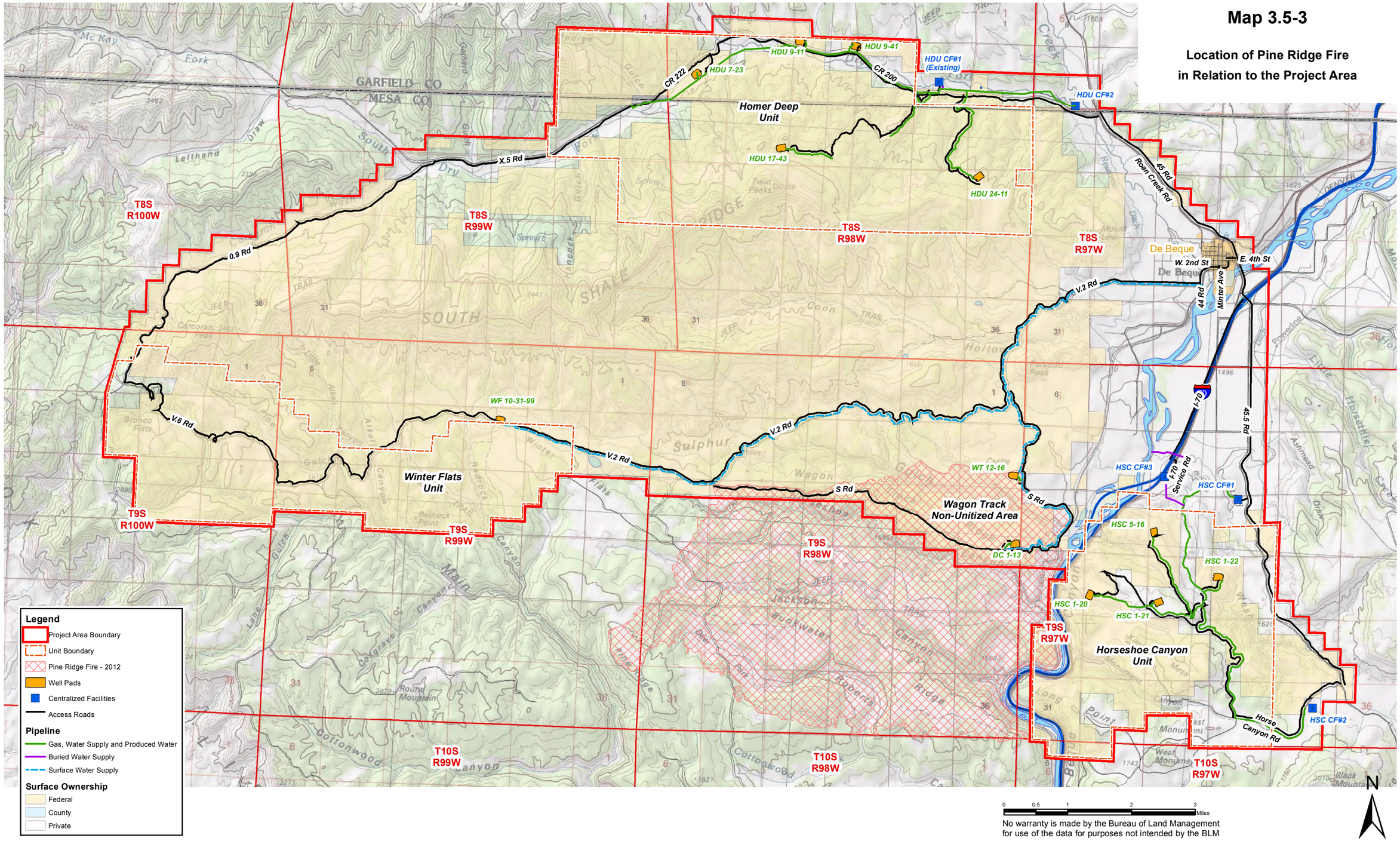
**Proposed Action Alternative**

Surface disturbance as a part of the Proposed Action would directly impact the BLM Fire Management Units (FMUs) B, C and D. Construction, use and maintenance of roads, gathering pipelines, well pads and centralized facilities would be the sources of disturbance. Approximately 299.9 acres of new disturbance would be expected across the FMUs (with 10 acre well pads; however, well pads would not exceed 6.8 acres under the Proposed Action); however, about 220.9 acres would be reclaimed and revegetated under the Proposed Action in the short-term.

During surface disturbance and oil and gas operations, ignition threats from heavy equipment and workers would likely pose the greatest risks to increasing the number of fires on the public lands, especially in dry conditions during summer months. Re-establishment of native and desirable grasses and forbs could reduce the threat of domination by non-native, fire-carrying species. Control of weeds, especially cheatgrass, is essential to fire and fuels management.

## Map 3.5-3

**Location of Pine Ridge Fire in Relation to the Project Area**

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**Protective/Mitigation Measures**
Black Hills' proposal includes the following BLM GJFO Standard COAs, to support fire and fuels management objectives:

- The operator will implement measures to prevent fires on public and private land and be responsible for the costs of suppressing fires on public lands that result from the actions of its employees, contractors, or subcontractors. Range or forest fires caused or observed by such personnel will be immediately reported to the BLM Grand Junction Dispatch at 970-257-4800. All fires or explosions that cause loss of oil or gas, damage to property or equipment, or injuries to personnel will immediately be reported to the BLM Grand Junction Field Office at 970-244-3000. During conditions of extreme fire danger, surface-use operations may be restricted or suspended in specific areas. Additional measures could be required by the BLM.
- BLM may require adaptive management techniques to minimize fire hazards/risks.

The BLM would also require the following measures:

- A Fire Management Plan (Plan) specific to oil and gas operations should be prepared by Black Hills and included in their Exploratory Proposal or in each APD, to assist Black Hills and its contractors to prevent and/or contain project-related accidental ignitions.
- A fire safety and evacuation plan should be prepared to instruct employees and contractors in case a wildfire move toward an active pad/facility, and what they should do if they start a wildfire.
- Proper precautions should be taken at all times to prevent wildfires. During conditions of extreme fire danger (e.g., National Weather Service issued Red Flag warning), surface use operations might be limited or suspended in specific areas.
- Trees and brush associated with construction may have to be removed from sites to prevent elevated and hazardous fuel loading. Cleared trees and brush may need to be mulched and scattered or incorporated into BMPs such as perimeter berms. In areas of dense forestation, trees should be removed to a distance of at least twice their height from any heat-producing facility. For example, 20 foot tall trees would need to be at least 40 feet from production facilities.
- Any welding, acetylene or other open flame, should be operated in an area barren or cleared of all flammable materials and no closer to vegetation than at least 10 feet.
- Internal combustion engines should be equipped with approved spark arrestors and vehicles should be parked in designated areas without fire/fuels hazards.

**No Action Alternative**
Under this alternative, the Proposed Action would not be constructed and operated. Fire danger from existing uses would continue but the Proposed Action would pose no additional fire threat.

### 3.5.9 Wild Horse and Burro

#### 3.5.9.1 Current Conditions

The 1971 Wild and Free-Roaming Horse and Burro Act provides for the management, protection and control of all unbranded and unclaimed horses and burros on public lands administered by the BLM and the Forest Service. The Little Book Cliffs WHR was established by the BLM in 1974 (BLM, 1985) and is one of three ranges in the United States set aside

specifically to protect wild and free roaming horses. Map 3.5-1 shows the WHR in relation to the project area. The Little Book Cliffs WSA overlaps about two thirds of the area.

Currently, the GJFO manages the 36,113 acre area to optimize range habitat and health in order to support 90 to 150 wild horses (BLM, 2009a). Natural barriers such as cliffs and canyons are supplemented with fencing to define the area and control horse movement.

The WHR contains several popular trails for hiking, horse viewing and horseback riding. Visitors are directed to access the WHR via the Winter Flats Road (Road V.2).

#### 3.5.9.2 Environmental Consequences

**Proposed Action Alternative**

The WHR would not be directly impacted by the Proposed Action as proposed surface disturbance does not coincide with it. Mesa County V.2 Road, which provides access to the wild horse area and to existing area oil and gas facilities, would also be used to access the proposed well pad in the Winter Flats Unit (WF 10-31-99). Indirect effects such as increased noise, dust, vehicular traffic and human activity could occur during construction and road maintenance, but would occur several miles from the northern portion of the WHR. Measures to reduce traffic during construction and operation (carpooling, water gathering lines, remote telemetry) would be expected to limit such indirect impacts to the WHR but could cause some inconvenience to recreationists travelling the road.

**Protective/Mitigation Measures**

None.

**No Action Alternative**

Under the No Action Alternative, Black Hills would not implement the Proposed Action and none of the potential indirect impacts to the WHR would occur.

### 3.5.10 Land Tenure, Rights of Way and other Uses

#### 3.5.10.1 Current Conditions

The Proposed Action would be located on both private and federal lands administered by the BLM GJFO. A listing of the authorized and pending rights-of-way in the project area that could be directly or indirectly affected is provided in Appendix J.

#### 3.5.10.2 Environmental Consequences

**Proposed Action Alternative**

For proposed activities within federal oil and gas Units (e.g., Homer Deep, Winter Flats and Horseshoe Canyon), separate right-of-way grants and temporary use permits would not be required for installation and operation of buried pipelines (gas gathering, water supply and produced water) or for temporary surface water pipelines. However, portions of such features located off-Unit would require right-of-way grants and temporary use permits. In accordance with the BLM GJFO Standard COAs, adherence to this condition would minimize potential impacts to existing right-of-way holders.

**Protective/Mitigation Measures**

The following BLM GJFO Standard COAs would be required:

- The operator shall obtain agreements allowing construction and maintenance with all existing right-of-way holders, authorized users and pipeline operators prior to surface disturbance or construction of the location or access across or adjacent to any existing

or approved rights-of-way or pipelines. In the case of privately owned surface, the operator shall certify to BLM that a Surface Use Agreement has been reached with the private surface owners prior to commencing construction and that the owner has been provided a copy of the SUPO that is part of a Federal APD. If Agreement cannot be reached, the operator shall comply with provisions of the law or regulations governing the Federal right of re-entry to the surface (43 CFR 3814).

- BLM authorization is contingent upon receipt of and compliance with all applicable federal, state, county, municipal and local permits, including all necessary environmental clearances and permits (Colorado Oil and Gas Conservation Commission (COGCC), U.S. Army Corps of Engineers (USACE), U.S. Fish & Wildlife, U.S. Forest Service, Colorado Department of Transportation, Colorado Department of Health & Environment, County Oil and Gas liaisons, County Health and Road Departments, municipalities, etc.).
- The operator will notify the BLM representative at least 48 hours prior to initiation of construction or reclamation activities. A pre-construction meeting may be scheduled to review all conditions and or stipulations with the operator. Complete copies of all applicable permits, will be kept on site during construction and drilling activities. All on-site personnel will review the approved permit with the COAs before working on the project.

**No Action Alternative**

Under the No Action Alternative, Black Hills would not construct the proposed well pads, pipelines, road upgrades and centralized facilities. Existing right-of-way holders and other authorized users would not be impacted.

# CHAPTER 4 – CUMULATIVE EFFECTS

## 4.1 INTRODUCTION

Cumulative effects are defined in the CEQ regulations (40 CFR 1508.7) as "*...the impact on the environment that results from the incremental impact of the action when added to other past, present and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions*." Cumulative effects analysis typically encompasses broader areal and time frames than analysis of direct and indirect effects. The actions and effects selected for analysis depend on access to reasonably available data.

## 4.2 ACTIONS ANALYZED

Table 4.2-1 lists the past, present and reasonably foreseeable future actions within the area affected by the Proposed Action. The geographic scope used for analysis varies for each cumulative effects issue. For this analysis, foreseeable actions are considered to be limited to those for which some formal notice or permit application has been made and does not include potential developments which are speculative. Disturbance from the Proposed Action is included in foreseeable actions.

**Table 4.2-1**
**Past, Present and Reasonably Foreseeable Actions**

| Impact Sources | Analysis Rationale |
|---|---|
| **Analyzed Impact Sources** | |
| Minerals Industry | |
| Oil and Gas Wells | Public data are available from COGCC and NEPA documents (federal wells) for analysis of existing and foreseeable disturbance. |
| Pipelines | The BLM GJFO maintains some GIS files on locations of relatively recent existing pipelines but they may not have construction dates. Buried pipelines are typically reclaimed immediately after installation, but reclamation success cannot be assumed. For this analysis, a 10-foot wide inspection corridor has been assumed as long-term disturbance. Data regarding foreseeable pipelines have been obtained from the GJFO NEPA Register and the database of FERC filings. Well pad gathering line disturbance has been included under oil and gas well estimates. |
| Mining | Public data are available from CGS (dated) regarding active and permitted mines. BLM NEPA documents and logs help inform existing and some foreseeable mine projects. |
| Utilities | |
| Electric Power Lines | The BLM GJFO maintains GIS and project files on power line ROWs for other filings from utility companies. Disturbance is estimated long-term inspection corridor, but is generally stabilized. |
| Roads | |
| Federal and State Highways | Public data are available from CDOT. Data regarding some foreseeable roads is available from NEPA documents and logs. |
| County Main Roads | |
| County Local Roads | |
| Vegetation Management | |

| Impact Sources | Analysis Rationale |
|---|---|
| Hazardous Fuels Reductions | The BLM GJFO maintains files on past and proposed projects |
| **Non-analyzed Impact Sources** | |
| Minerals Industry | |
| Gas Plants & Facilities | Public data are not currently available from COGCC for existing facilities other than pits, which are included in well pad estimates. Other sources for gas plants not identified. |
| Other | |
| Grazing | There are no readily available and comprehensive data sources regarding existing and foreseeable impacts to the land from grazing operations. Grazing represents a long-term and historical use of the land and the levels of acceptable grazing loads have typically been determined based on prior usage. In most cases, these levels are expected to be continued into the future with minor variations. |

The levels of surface disturbance associated with the analyzed impact types indicated in Table 4.2-1 are used as best estimates for total impacts to the human environment. The rationale is that levels of surface disturbance are among the most comprehensive and readily determined impacts and because disturbance to the surface results in direct and indirect effects to many analyzed resources.

## 4.3 CUMULATIVE EFFECTS AREAS ANALYZED

The areas to be analyzed for cumulative effects have been selected based on several criteria. Because of the complexity of analyzing impacts to multiple resources from multiple sources, common analysis areas have been used for different resources, where such usage is logically defensible. The analysis areas selected for each analyzed resource and the rationales for those selections are indicated in Table 4.3-1. Maps 4.3-1 and 4.3-2 show the Cumulative Effects Analysis Areas (CEAAs).

**Table 4.3-1**
**Cumulative Effects Analysis Areas**

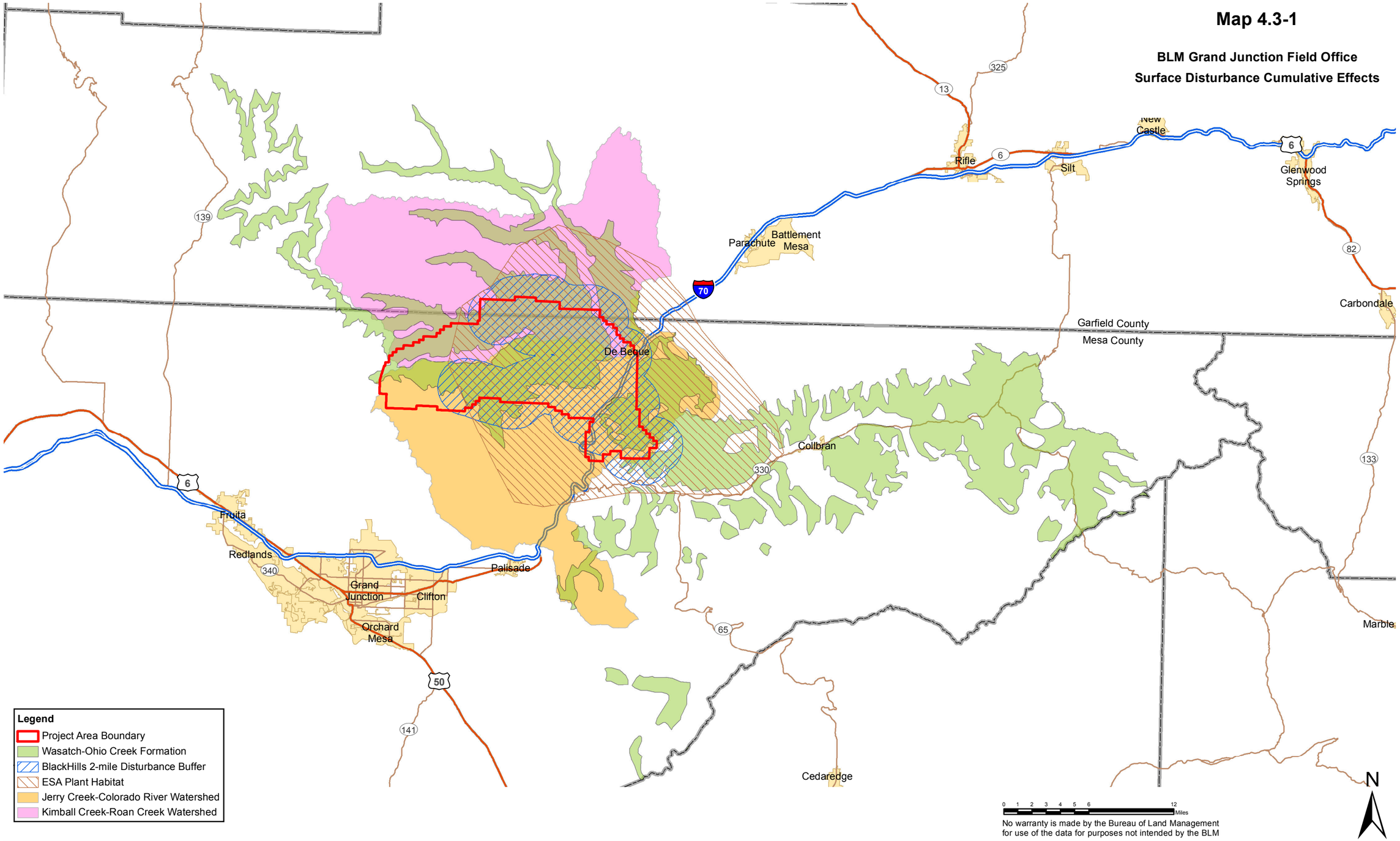
| Resource | Cumulative Effects Analysis Area | CEAA Area (Acres) | Rationale |
|---|---|---|---|
| **PHYSICAL RESOURCES** | | | |
| Air Quality | Domain extending 100 km from Project Area including all of the GJFO | N/A | Direct impacts from the Proposed Action would not cause an exceedance of any ambient air quality standard and would not exceed the Prevention of Significant Deterioration Increments within the modeling domain. In addition direct project impacts to AQRVs (visibility, atmospheric deposition and potential sensitive lake acidification) would be below threshold values at all Class I and sensitive Class II areas with the domain. |
| Geological Resources | NO IMPACT | | NO IMPACT |
| Mineral Resources | GJFO Portions of Kimball Creek-Roan Creek and Jerry Creek-Colorado River 5th-level Watersheds [1] | 315,131 | The CEAA contains the entire project disturbance, encompasses much of the local oil and gas development under control of the GFJO, and contains local exploitable mineral deposits in the vicinity of the project. |
| Soil Resources* | GJFO Portions of Kimball Creek-Roan Creek and Jerry Creek-Colorado River 5th-level Watersheds [1] | 315,131 | All project disturbances would occur within portions of these watersheds. Soil transport would be downstream within the watersheds. |
| Surface and Ground Water Quality* | GJFO Portions of Kimball Creek-Roan Creek and Jerry Creek-Colorado River 5th-level Watersheds [1] | 315,131 | All project surface water flow would be within these watersheds.<br>The watersheds also contain almost all of the local water wells, which are developed in alluvial aquifers. |
| Noise | Project Area | N/A | Noise levels would be localized to the project area. |
| **BIOLOGICAL RESOURCES** | | | |
| Invasive, Non-native Species | GJFO Portions of Kimball Creek-Roan Creek and Jerry Creek-Colorado River 5th-level Watersheds [1] | 315,131 | Dispersal of invasive seeds from the project and transport into the project area would be contained within the watersheds. |

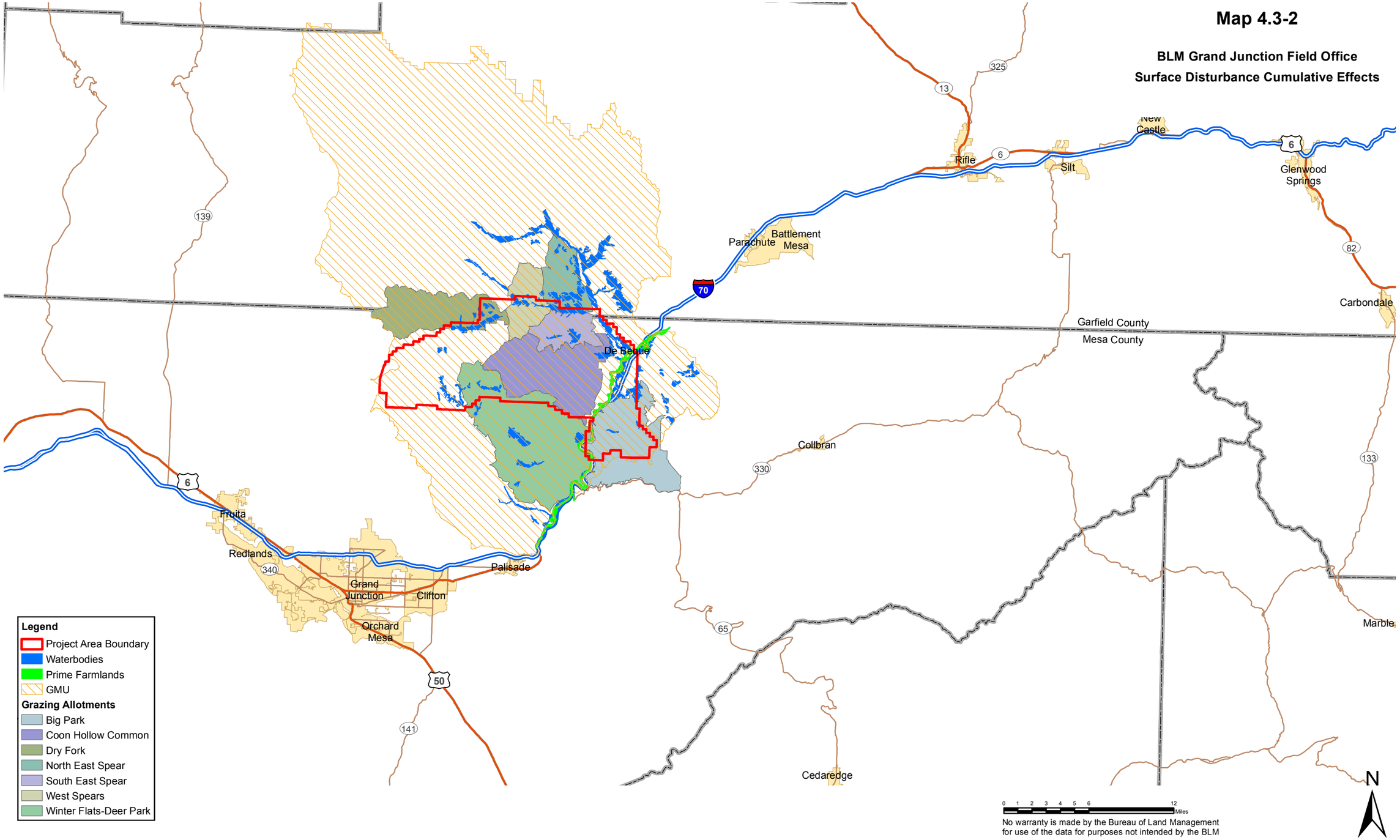
| Resource | Cumulative Effects Analysis Area | CEAA Area (Acres) | Rationale |
|---|---|---|---|
| Sensitive Species (Plant or Animal) | GJFO Portions of CPW GMUs 31 and 42 [2] | 421,723 | All project disturbances would occur within these GMUs and within those portions within the jurisdiction of the GJFO. The CEAA is sufficiently large to be representative of the habitat of the numerous special status species potentially present in the vicinity of the project. |
| Threatened or Endangered Animal Species | GJFO Portions of Kimball Creek-Roan Creek and Jerry Creek-Colorado River 5th-level Watersheds [1] | 315,131 | All project disturbances would occur within these GMUs and within those portions within the jurisdiction of the GJFO. The CEAA is sufficiently large to be representative of the habitat of federally listed, proposed, or candidate species potentially present in the area, including the endangered Colorado River fish. |
| Threatened or Endangered Plant Species | Combined habitat of DeBeque Phacelia and northern population of *S. glaucus* [3] | 202,708 | The CEAA encompasses all known populations and likely habitat for the two federally listed plant species which may occur within the vicinity of the project. |
| Vegetation and Forestry | GJFO Portions of Kimball Creek-Roan Creek and Jerry Creek-Colorado River 5th-level Watersheds [1] | 315,131 | The combined watershed is of sufficient size to contain most local cumulative impacts to vegetation subject to GJFO jurisdiction and the project facilities are located near the center of the combined watershed. |
| Wetlands and Riparian Zones | Approximate riparian within affected 5th-level watersheds [6] | 1,605 | The CEAA encompasses the estimates of riparian habitat within defined affected 5th-level watersheds. |
| Wildlife | GJFO Portions of CPW GMUs 31 and 42 [2] | 421,723 | The CEAA includes the range of local big game species and encompasses the local range of smaller, less mobile, species. |
| **HERITAGE RESOURCES AND HUMAN ENVIRONMENT** | | | |
| Cultural or Historical Resources | NOT SELECTED | NA | As cultural resource sites would be avoided, there would likely be no direct, indirect, or cumulative impacts. |
| Paleontological Resources | GJFO area of Wasatch Formation outcrop [4] | 277,621 | The CEAA covers impacts to the only PFYC unit which is rated 4 or 5, which would be affected by direct or indirect project impacts. |

| Resource | Cumulative Effects Analysis Area | CEAA Area (Acres) | Rationale |
|---|---|---|---|
| Tribal and American Indian Religious Concerns | NOT SELECTED | NA | As American Indian religious sites would be avoided, there would likely be no direct, indirect, or cumulative impacts. |
| Visual Resources | Project disturbance area buffered 2 miles | 95,675 | Approximate limit of visibility of project disturbance and facilities. |
| Socioeconomics | Mesa and Garfield counties | 4,016,979 | The CEAA for socioeconomics is the same as that analyzed under direct and indirect impacts. No additional cumulative impacts are expected. |
| Environmental Justice | Mesa and Garfield counties | 4,016,979 | The CEAA for socioeconomics is the same as that analyzed under direct and indirect impacts. No additional cumulative impacts. |
| Transportation and Access | Mesa and Garfield counties | 4,016,979 | The CEAA for transportation and access includes most of the road network that would be used to access the project. |
| Wastes, Hazardous or Solid | GJFO Portions of Kimball Creek-Roan Creek and Jerry Creek-Colorado River 5th-level Watersheds [1] | 315,131 | The CEAA includes all sources of waste generated by the project, is of sufficient size to include other localized waste sources and would contain local stream transport of potential spills. |
| **LAND RESOURCES** | | | |
| Prime or Unique Farmlands | Soil mapping units 15, 32 and 54 within two affected 5th-level watersheds | 13,415 | The CEAA includes identified prime farmland soils within watersheds that drain project disturbance. |
| Recreation | GJFO Portions of CPW GMUs 31 and 42 [2] | 421,723 | The CEAA includes local big game management units affecting hunting as well as the local stretch of the Colorado River which may be used for rafting recreation. |
| Special Designations (ACEC, SMAs, etc.) | GJFO Portions of Kimball Creek-Roan Creek and Jerry Creek-Colorado River 5th-level Watersheds [1] | 315,131 | The CEAA includes the only ACEC or SMA potentially affected by impacts from the proposed project. |

| Resource | Cumulative Effects Analysis Area | CEAA Area (Acres) | Rationale |
|---|---|---|---|
| Wild and Scenic Rivers | GJFO Portions of Kimball Creek-Roan Creek and Jerry Creek-Colorado River 5th-level Watersheds [1] | 315,131 | The CEAA contains segments of the Colorado River determined potentially eligible by the GJFO for inclusion in the National Wild and Scenic Rivers system. |
| Wilderness | GJFO Portions of Kimball Creek-Roan Creek and Jerry Creek-Colorado River 5th-level Watersheds [1] | 315,131 | The CEAA contains the Book Cliffs WSA, as well as the Horse Mountain, South Shale Ridge and Cow Ridge areas, determined by GJFO 2012 wilderness inventory to possess wilderness characteristics. |
| Range Management | Grazing allotments potentially affected by project surface-disturbing activities [5] | 110,788 | The CEAA contains all surface disturbance and ongoing operations activities associated with the proposed project. |
| Wild Horses and Burros | GJFO Portions of Kimball Creek-Roan Creek and Jerry Creek-Colorado River 5th-level Watersheds [1] | 315,131 | The CEAA contains all project disturbances as well as most of the Little Book Cliffs herd management area. |
| Land Tenure, ROW and Other Uses | GJFO Portions of CPW GMUs 31 and 42 [2] | 421,723 | The CEAA encompasses most of the local oil and gas development drained by streams on both sides of the Colorado River. Many past, present and foreseeable realty actions are oil and gas related. |

[1] Fifth order watersheds determined from the USGS National Hydrographic Dataset
[2] Game management unit boundaries from Colorado Parks and Wildlife GIS datasets
[3] Combined FWS DeBeque Phacelia survey areas and area of northern *S. glaucus* population from McGlaughlin and Ramp-Neale 2012 genetic study.
[4] Wasatch-Ohio Creek Formations from Digital Geologic Map of Colorado, USGS OFR 92-0507.
[5] Includes NE Spear, W Spears, SE Spear, Brink Pedigo Gulch, Dry Fork, Corcoran Wash, Homestead, Red Rock, Winter Flats-Deer Park, Coon Hollow Common and Big Park allotments.
[6] USGS NHD 100k water bodies layer buffered 200 ft. minus the water bodies layer.


Map 4.3-1
BLM Grand Junction Field Office
Surface Disturbance Cumulative Effects
New Castle
Rifle
Silt
Glenwood Springs
Parachute
Battlement Mesa
De Beque
Collbran
Carbondale
Garfield County
Mesa County
Fruita
Redlands
Grand Junction
Clifton
Orchard Mesa
Palisade
Cedaredge
Marble
70
6
13
325
139
82
330
133
65
340
50
141
Legend
Project Area Boundary
Wasatch-Ohio Creek Formation
BlackHills 2-mile Disturbance Buffer
ESA Plant Habitat
Jerry Creek-Colorado River Watershed
Kimball Creek-Roan Creek Watershed
0 1 2 3 4 5 6 12
Miles
No warranty is made by the Bureau of Land Management
for use of the data for purposes not intended by the BLM
N


Map 4.3-2
BLM Grand Junction Field Office
Surface Disturbance Cumulative Effects
Rifle
Silt
New Castle
Glenwood Springs
Parachute
Battlement Mesa
Carbondale
Garfield County
Mesa County
De Beque
Collbran
Fruita
Redlands
Palisade
Grand Junction
Clifton
Orchard Mesa
Cedaredge
Marble
13
325
6
139
70
82
330
133
340
50
141
65
Legend
Project Area Boundary
Waterbodies
Prime Farmlands
GMU
Grazing Allotments
Big Park
Coon Hollow Common
Dry Fork
North East Spear
South East Spear
West Spears
Winter Flats-Deer Park
0 1 2 3 4 5 6 12
Miles
No warranty is made by the Bureau of Land Management
for use of the data for purposes not intended by the BLM
N

## 4.4 CUMULATIVE EFFECTS

Past and present oil and gas well pads were determined to have an average long-term disturbance of approximately 4.0 and 1.1 acres for multi-well and single well pads, respectively, based on review of 2011 National Agriculture Imagery Program (NAIP) imagery. Based on the total well count and estimated numbers of multiple and single well pads, total disturbance on a per-well basis are estimated to be approximately 2.3 acres, including associated access roads and pipelines. Estimates were based upon data from the BLM GJFO and calculations made by the BLM Vernal Field Office and published in that office's Cumulative Effects Analysis Technical Support Document (BLM 2012c). Because the geologic horizons and drilling technologies are similar between the two BLM resource areas, it is assumed that disturbance values would also be similar, in the absence of more detailed, publicly-available data (BLM, 2012f; BLM 2012g; and USGS, 2002). For foreseeable wells, which are those for which an APD has been issued by COGCC, or NEPA notification made, but for which no operations have been conducted, the average disturbance per well is estimated to be 1.3 acres. This is because about half of the identified foreseeable wells would be drilled on existing well pads containing multiple wells.

Except for recent installations, pipeline and power line disturbance is assumed to be reclaimed. Because available data did not include installation dates, all such disturbance has been assumed to be reclaimed. Remaining disturbance widths for pipelines and power lines are estimated to be 10 feet, assuming the width of a remaining inspection corridor after reclamation of the construction disturbance. Mining disturbance was estimated from the value for affected surface area indicated in the permitted mines GIS data from the Colorado Division of Mines, Reclamation and Safety. Some of these mines are not active and show no surface disturbance.

Roads data were taken from CDOT GIS data. Disturbance estimates for past and present roads were made using estimates for average width of different road types based upon review of NAIP imagery. Disturbance from past and present hazardous fuels reduction projects have been obtained from GJFO GIS data.

Surface disturbance estimates for different types of projects for the different CEAAs are summarized in Table 4.4-1.

**Table 4.4-1**
**Summary of Cumulative Surface Disturbance**

| Facility Type and Cumulative Effects Analysis Area (CEAA) | Count or Miles | Facility Dist. (acres) or ROW (feet) | Total Dist. (acres) | Count or Miles | Facility Dist. (acres) or ROW (feet) | Total Dist. (acres) |
|---|---|---|---|---|---|---|
| | Past and Present Activities | | | Reasonably Foreseeable Activities | | |
| Affected 5th-order Watersheds | | | 12,248 | | | 511 |
| Industry – Total | | | 2,950 | | | 511 |
| Oil & Gas Wells, Access, & Facilities | 912 | 2.3 | 2,101 | 175 | 1.3 | 349 |
| Mining | 21 | Variable | 553 | 0 | Variable | 0 |
| Pipelines | 117.0 | 10 | 142 | 27.3 | Variable | 162 |
| Electric Power Lines | 127.5 | 10 | 155 | 0 | 10 | 0 |
| Roads – Total | | | 843 | | | 0 |
| Highways | 20.9 | 60 | 152 | 0 | 60 | 0 |
| County Roads | 18.1 | 40 | 88 | 0 | 40 | 0 |
| Local Roads | 165.9 | 30 | 603 | 0 | 30 | 0 |
| Other – Total | | | 8,455 | | | 0 |
| Hazardous Fuels Reduction | 105 | Variable | 8,455 | 0 | Variable | 0 |
| Affected Portions CPW GMUs 31 & 42 | | | 14,643 | | | 590 |
| Industry – Total | | | 2,862 | | | 590 |
| Oil & Gas Wells, Access, & Facilities | 856 | 2.3 | 1,972 | 236 | 1.3 | 428 |
| Mining | 21 | Variable | 553 | 0 | Variable | 0 |
| Pipelines | 130.2 | 10 | 158 | 27.3 | Variable | 162 |
| Electric Power Lines | 148.0 | 10 | 179 | 0 | 10 | 0 |
| Roads – Total | | | 963 | | | 0 |
| Highways | 16.4 | 60 | 119 | 0 | 60 | 0 |
| County Roads | 18.1 | 40 | 88 | 0 | 40 | 0 |
| Local Roads | 207.9 | 30 | 756 | 0 | 30 | 0 |
| Other – Total | | | 10,818 | | | 0 |
| Hazardous Fuels Reduction | 114 | Variable | 10,818 | 0 | Variable | 0 |
| Combined *Phacelia, S. glaucus* Habitat | | | 7,090 | | | 359 |
| Industry – Total | | | 1,224 | | | 359 |
| Oil & Gas Wells, Access, & Facilities | 193 | 2.3 | 445 | 58 | 1.3 | 197 |
| Mining | 21 | Variable | 553 | 0 | Variable | 0 |
| Pipelines | 91.8 | 10 | 111 | 27.3 | Variable | 162 |

| Facility Type and Cumulative Effects Analysis Area (CEAA) | Count or Miles | Facility Dist. (acres) or ROW (feet) | Total Dist. (acres) | Count or Miles | Facility Dist. (acres) or ROW (feet) | Total Dist. (acres) |
|---|---|---|---|---|---|---|
| | Past and Present Activities | | | Reasonably Foreseeable Activities | | |
| Electric Power Lines | 95.1 | 10 | 115 | 0 | 10 | 0 |
| Roads – Total | | | 803 | | | 0 |
| Highways | 41.6 | 60 | 303 | 0 | 60 | 0 |
| County Roads | 17.2 | 40 | 83 | 0 | 40 | 0 |
| Local Roads | 114.6 | 30 | 417 | 0 | 30 | 0 |
| Other – Total | | | 5,063 | | | 0 |
| Hazardous Fuels Reduction | 56 | Variable | 5,063 | 0 | Variable | 0 |
| GJFO Surficial Wasatch Formation | | | 19,746 | | | 481 |
| Industry – Total | | | 1,706 | | | 481 |
| Oil & Gas Wells, Access, & Facilities | 612 | 2.3 | 1,410 | 237 | 1.3 | 377 |
| Mining | 10 | Variable | 110 | 0 | Variable | 0 |
| Pipelines | 104.9 | 10 | 127 | 17.1 | Variable | 104 |
| Electric Power Lines | 48.6 | 10 | 59 | 0 | 10 | 0 |
| Roads – Total | | | 927 | | | 0 |
| Highways | 3.8 | 60 | 28 | 0 | 60 | 0 |
| County Roads | 42.7 | 40 | 207 | 0 | 40 | 0 |
| Local Roads | 190.5 | 30 | 693 | 0 | 30 | 0 |
| Other – Total | | | 17,113 | | | 0 |
| Hazardous Fuels Reduction | 99 | Variable | 17,113 | 0 | Variable | 0 |
| Project Disturbance 2-mile Buffer | | | 4,060 | | | 322 |
| Industry – Total | | | 852 | | | 322 |
| Oil & Gas Wells, Access, & Facilities | 130 | 2.3 | 299 | 30 | 1.3 | 160 |
| Mining | 13 | Variable | 376 | 0 | Variable | 0 |
| Pipelines | 74.6 | 10 | 90 | 27.3 | Variable | 162 |
| Electric Power Lines | 71.2 | 10 | 86 | 0 | 10 | 0 |
| Roads – Total | | | 421 | | | 0 |
| Highways | 11.6 | 60 | 84 | 0 | 60 | 0 |
| County Roads | 15.1 | 40 | 73 | 0 | 40 | 0 |
| Local Roads | 72.4 | 30 | 263 | 0 | 30 | 0 |
| Other – Total | | | 2,787 | | | 0 |
| Hazardous Fuels Reduction | 36 | Variable | 2,787 | 0 | Variable | 0 |

| Facility Type and Cumulative Effects Analysis Area (CEAA) | Count or Miles | Facility Dist. (acres) or ROW (feet) | Total Dist. (acres) | Count or Miles | Facility Dist. (acres) or ROW (feet) | Total Dist. (acres) |
|---|---|---|---|---|---|---|
| | Past and Present Activities | | | Reasonably Foreseeable Activities | | |
| Mesa and Garfield Counties | | | 15,109 | | | 0 |
| Roads – Total | | | 15,109 | | | 0 |
| Highways | 438.1 | 60 | 3,186 | NA | 60 | 0 |
| County Roads | 682.7 | 40 | 3,310 | NA | 40 | 0 |
| Local Roads | 2,368.4 | 30 | 8,612 | NA | 30 | 0 |
| Affected BLM Grazing Allotments | | | 5,068 | | | 333 |
| Industry – Total | | | 415 | | | 333 |
| Oil & Gas Wells, Access, & Facilities | 125 | 2.3 | 288 | 38 | 1.3 | 171 |
| Mining | 2 | Variable | 0 | 0 | Variable | 0 |
| Pipelines | 74.8 | 10 | 91 | 27.3 | Variable | 162 |
| Electric Power Lines | 29.9 | 10 | 36 | 0 | 10 | 0 |
| Roads – Total | | | 255 | | | 0 |
| Highways | 1.9 | 60 | 14 | 0 | 60 | 0 |
| County Roads | 8.4 | 40 | 41 | 0 | 40 | 0 |
| Local Roads | 55.0 | 30 | 200 | 0 | 30 | 0 |
| Other – Total | | | 4,399 | | | 0 |
| Hazardous Fuels Reduction | 43 | Variable | 4,399 | 0 | Variable | 0 |
| Riparian Habitat | | | 114 | | | 0 |
| Industry – Total | | | 6 | | | 0 |
| Oil & Gas Wells, Access, & Facilities | 0 | 2.3 | 0 | 0 | 1.3 | 0 |
| Mining | 1 | Variable | 0 | 0 | Variable | 0 |
| Pipelines | 0.0 | 10 | 0 | 0 | Variable | 0 |
| Electric Power Lines | 5.2 | 10 | 6 | 0 | 10 | 0 |
| Roads – Total | | | 108 | | | 0 |
| Highways | 14.4 | 60 | 105 | 0 | 60 | 0 |
| County Roads | 0.2 | 40 | 1 | 0 | 40 | 0 |
| Local Roads | 0.6 | 30 | 2 | 0 | 30 | 0 |
| Other – Total | | | 0 | | | 0 |
| Hazardous Fuels Reduction | 0 | Variable | 0 | 0 | Variable | 0 |
| Prime Farmland Soils | | | 561 | | | 92 |
| Industry – Total | | | 57 | | | 92 |

| Facility Type and Cumulative Effects Analysis Area (CEAA) | Count or Miles | Facility Dist. (acres) or ROW (feet) | Total Dist. (acres) | Count or Miles | Facility Dist. (acres) or ROW (feet) | Total Dist. (acres) |
|---|---|---|---|---|---|---|
| | Past and Present Activities | | | Reasonably Foreseeable Activities | | |
| Oil & Gas Wells, Access, & Facilities | 13 | 2.3 | 30 | 6 | 1.3 | 51 |
| Mining | 3 | Variable | 1 | 0 | Variable | 0 |
| Pipelines | 2.3 | 10 | 3 | 6.8 | Variable | 41 |
| Electric Power Lines | 19.3 | 10 | 23 | 0 | 10 | 0 |
| Roads – Total | | | 114 | | | 0 |
| Highways | 4.4 | 60 | 32 | 0 | 60 | 0 |
| County Roads | 4.2 | 40 | 20 | 0 | 40 | 0 |
| Local Roads | 16.9 | 30 | 61 | 0 | 30 | 0 |
| Other – Total | | | 390 | | | 0 |
| Hazardous Fuels Reduction | 6 | Variable | 390 | 0 | Variable | 0 |

### 4.4.1 Air Quality

A cumulative air quality impact assessment quantified potential air quality impacts to both ambient air concentrations and AQRVs from air pollutant emissions of $NO_x$, $SO_2$, $PM_{10}$ and $PM_{2.5}$ expected to result from the Proposed Action and other nearby reasonably foreseeable development (RFD) emissions. The emissions included in the cumulative analysis are shown in Table 4.4-2. Cumulative ambient air quality impacts of $NO_2$, $SO_2$, $PM_{10}$ and $PM_{2.5}$ and AQRVs were analyzed at far-field federal Class I and sensitive Class II areas located within 100 km of the BHDEP project area. These include the Class I Black Canyon of the Gunnison Wilderness, Flat Tops Wilderness, Maroon Bells–Snowmass Wilderness, West Elk Wilderness and Arches National Park and Class II Raggeds Wilderness Area and Colorado National Monument. In addition, nine lakes that are designated as acid sensitive and are located within the Flat Tops Wilderness area (Ned Wilson Lake, Upper Ned Wilson Lake, Lower Packtrail Pothole and Upper Packtrail Pothole), Maroon Bells-Snowmass Wilderness area (Avalanche Lake, Capitol Lake and Moon Lake), Raggeds Wilderness area (Deep Creek Lake) and West Elk Wilderness area (South Golden Lake) were assessed for potential lake acidification from atmospheric deposition impacts.

The far-field analyses used the EPA-approved version of the CALPUFF modeling system (Version 5.8) along with a windfield developed for year 2008 using the MMIF Version 2.1 (ENVIRON, 2012) and the 2008 WRF meteorological model output that was produced as part of the WRAP West-wide Jump Start Air Quality Modeling Study (WestJumpAQMS) (ENVIRON et al., 2012).

**Table 4.4-2**
**BHDEP and Regional Source Emissions (tpy)**

| Activity | $PM_{10}$ | $PM_{2.5}$ | $NO_x$ | $SO_2$ |
|---|---|---|---|---|
| BHDEP | 118.2 | 13.7 | 190.5 | 2.3 |
| Fram Whitewater Unit MDP | 109.2 | 13.2 | 182.4 | 3.0 |
| Bull Mountain Unit MDP | 60.4 | 7.2 | 107.4 | 29.0 |
| Gunnison Energy | 14.4 | 5.9 | 151.7 | 2.0 |
| Meeker Gas Plant Expansion | 28.1 | 28.1 | 95.2 | 87.1 |
| **Total Emissions** | 330.3 | 68.1 | 727.2 | 123.4 |

*PSD Increment Comparison*. The direct modeled cumulative concentrations of $NO_2$, $SO_2$, $PM_{10}$ and $PM_{2.5}$ at Class I and sensitive Class II areas are provided in Table 4.4-3 for comparison to applicable PSD Class I and Class II increments. As shown in Table 4.4-3, these values are well below the PSD Class I and Class II increments.

**Table 4.4-3**
**Cumulative Pollutant Concentrations at PSD Class I and Sensitive Class II Areas (µg/m$^3$)**

| Location | Pollutant | Averaging Time | Direct Modeled | PSD Increment |
|---|---|---|---|---|
| Arches National Park | $NO_2$ | Annual | 0.001 | 2.5 |
| | $SO_2$ | 3-hour | 0.001 | 25 |
| | | 24-hour | 0.0004 | 5 |
| | | Annual | 0.00005 | 2 |
| | $PM_{10}$ | 24-hour | 0.056 | 8 |
| | | Annual | 0.003 | 4 |
| | $PM_{2.5}$ | 24-hour | 0.027 | 2 |
| | | Annual | 0.001 | 1 |

| Location | Pollutant | Averaging Time | Direct Modeled | PSD Increment |
|---|---|---|---|---|
| Black Canyon of the Gunnison Wilderness Area | $NO_2$ | Annual | 0.001 | 2.5 |
| | $SO_2$ | 3-hour | 0.001 | 25 |
| | | 24-hour | 0.0005 | 5 |
| | | Annual | 0.0003 | 2 |
| | $PM_{10}$ | 24-hour | 0.056 | 8 |
| | | Annual | 0.004 | 4 |
| | $PM_{2.5}$ | 24-hour | 0.029 | 2 |
| | | Annual | 0.002 | 1 |
| Flat Tops Wilderness Area | $NO_2$ | Annual | 0.0005 | 2.5 |
| | $SO_2$ | 3-hour | 0.0005 | 25 |
| | | 24-hour | 0.0002 | 5 |
| | | Annual | 0.00002 | 2 |
| | $PM_{10}$ | 24-hour | 0.053 | 8 |
| | | Annual | 0.004 | 4 |
| | $PM_{2.5}$ | 24-hour | 0.022 | 2 |
| | | Annual | 0.001 | 1 |
| Maroon Bells - Snowmass Wilderness Area | $NO_2$ | Annual | 0.0004 | 2.5 |
| | $SO_2$ | 3-hour | 0.0003 | 25 |
| | | 24-hour | 0.0001 | 5 |
| | | Annual | 0.00002 | 2 |
| | $PM_{10}$ | 24-hour | 0.046 | 8 |
| | | Annual | 0.003 | 4 |
| | $PM_{2.5}$ | 24-hour | 0.019 | 2 |
| | | Annual | 0.001 | 1 |
| West Elk Wilderness Area | $NO_2$ | Annual | 0.0003 | 2.5 |
| | $SO_2$ | 3-hour | 0.0006 | 25 |
| | | 24-hour | 0.0002 | 5 |
| | | Annual | 0.00002 | 2 |
| | $PM_{10}$ | 24-hour | 0.029 | 8 |
| | | Annual | 0.002 | 4 |
| | $PM_{2.5}$ | 24-hour | 0.013 | 2 |
| | | Annual | 0.001 | 1 |
| Raggeds Wilderness Area | $NO_2$ | Annual | 0.0003 | 25 |
| | $SO_2$ | 3-hour | 0.0005 | 512 |
| | | 24-hour | 0.0001 | 91 |
| | | Annual | 0.00002 | 20 |
| | $PM_{10}$ | 24-hour | 0.039 | 30 |
| | | Annual | 0.003 | 17 |
| | $PM_{2.5}$ | 24-hour | 0.016 | 9 |
| | | Annual | 0.001 | 4 |
| Colorado National Monument | $NO_2$ | Annual | 0.009 | 25 |
| | $SO_2$ | 3-hour | 0.007 | 512 |
| | | 24-hour | 0.002 | 91 |
| | | Annual | 0.0003 | 20 |
| | $PM_{10}$ | 24-hour | 0.16 | 30 |
| | | Annual | 0.023 | 17 |
| | $PM_{2.5}$ | 24-hour | 0.059 | 9 |
| | | Annual | 0.006 | 4 |

*AQRV Impacts*.

Visibility Impacts. Visibility impacts estimated, calculated following FLAG 2010 (FLAG, 2010), at Class I and sensitive Class II areas resulting from cumulative source emissions are shown in Table 4.4-4. The visibility analysis indicated that there are no days predicted to be above the 1.0 Δdv threshold at any of the analyzed Class I and sensitive Class II areas. There is a maximum of one day predicted above the 0.5 Δdv threshold at the Raggeds Class II Wilderness area and zero days above the 0.5 dv threshold at any of the other Class I and sensitive Class II areas. The maximum predicted visibility impact at the Raggeds Wilderness was 0.61 Δdv.

**Table 4.4-4**
**Cumulative Visibility Impacts at Class I and Sensitive Class II Areas**

| Location | Maximum Impact (Δdv) | Number of Days > 0.5 Δdv |
|---|---|---|
| Arches National Park | 0.24 | 0 |
| Black Canyon of the Gunnison Wilderness Area | 0.29 | 0 |
| Flat Tops Wilderness Area | 0.16 | 0 |
| Maroon Bells - Snowmass Wilderness Area | 0.41 | 0 |
| West Elk Wilderness Area | 0.22 | 0 |
| Raggeds Wilderness Area | 0.61 | 1 |
| Colorado National Monument | 0.46 | 0 |

Deposition Impacts. Potential cumulative atmospheric deposition impacts within Class I and PSD Class II sensitive areas were also calculated. At all Class I and sensitive Class II areas, the maximum N and S deposition impacts were predicted to be below the BLM thresholds of 3 kg/ha-yr for S and 1.5 kg/ha-yr for N. The predicted cumulative deposition values at each sensitive area are all below the DAT of 0.005 kg/ha-yr, except at the Maroon Bells – Snowmass and Raggeds Wilderness areas, where both N and S deposition are predicted to be above the DAT and at Colorado National Monument, where predicted N deposition is above the DAT. Predicted cumulative N and S deposition impacts are shown in Table 4.4-5.

**Table 4.4-5**
**Cumulative N and S Deposition Impacts at Class I and Sensitive Class II Areas**

| Location | Maximum N Deposition (kg/ha/yr) | Maximum S Deposition (kg/ha/yr) |
|---|---|---|
| Arches National Park | 0.0007 | 0.0003 |
| Black Canyon of the Gunnison Wilderness Area | 0.0021 | 0.0006 |
| Flat Tops Wilderness Area | 0.0022 | 0.0019 |
| Maroon Bells - Snowmass Wilderness Area | 0.0115 | 0.0052 |
| West Elk Wilderness Area | 0.0038 | 0.0011 |
| Raggeds Wilderness Area | 0.0221 | 0.0062 |
| Colorado National Monument | 0.0056 | 0.0010 |

In addition, potential changes in ANC, resulting from potential cumulative N and S deposition were calculated for nine sensitive lakes within the Flat Tops, Maroon Bells–Snowmass, Raggeds and West Elk Wilderness areas. For all lakes the estimated changes in ANC were all predicted to be less than the significance thresholds. The estimated change in ANC was 0.028

percent at Avalanche Lake, 0.029 percent at Capitol Lake, 0.12 percent at Moon Lake, 0.23 percent at Deep Creek Lake, 0.095 percent at Lower Packtrail Pothole, 0.058 percent at Upper Packtrail Pothole, 0.072 percent at Ned Wilson Lake and 0.029 percent at South Golden Lake (compared to the 10 percent threshold) and a 0.028 microequivalent per liter (μeq/l) change at the more sensitive Upper Ned Wilson Lake (compared to a 1.0 μeq/l threshold for sensitive lakes).

**Regional Air Quality Impacts**

As part of the adaptive management strategy for managing air resources within the BLM GJFO planning area, the BLM will be conducting a regional air modeling study to evaluate potential impacts on air quality from future mineral development in western Colorado. The modeling study, known as the Western Colorado Air Resources Management Modeling Study (West-CARMMS), will assess predicted impacts on air quality from projected increases in oil and gas development. The West-CARMMS will include potential impacts using projections of oil and gas development up to a maximum of 10 years in the future to reflect realistic estimations of development projections and technology improvements. The West-CARMMS results will include the predicted impacts from projected BLM oil and gas authorizations within the GJFO as well as cumulative impacts from all projected oil and gas development within the region. This study will analyze criteria pollutant impacts including ozone and AQRV impacts.

### 4.4.2 Mineral Resources

The CEAA for mineral resources is taken as the BLM GJFO portion of fifth-order watersheds affected by project disturbance, for the reasons indicated in Table 4.3-1, an area comprising approximately 315,131 acres. Past and present surface disturbance from analyzed activities within the CEAA is approximately 12,248 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be approximately 511 acres.

### 4.4.3 Soil Resources

The CEAA for soil resources is taken as the BLM GJFO portion of fifth-order watersheds affected by project disturbance, for reasons indicated in Table 4.3-1, an area comprising approximately 315,131 acres. Past and present surface disturbance from analyzed activities within the CEAA is approximately 12,248 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be approximately 511 acres. With reclamation and adherence to BLM GJFO Standard COAs and the SWMP, the Proposed Action would be mitigated and therefore, cumulative impacts to soils could be minimal.

### 4.4.4 Surface and Ground Water Quality

The CEAA for water resources is taken as the BLM GJFO portion of fifth-order watersheds affected by project disturbance, for the reasons indicated in Table 4.3-1, an area comprising approximately 315,131 acres. Past and present surface disturbance from analyzed activities within the CEAA is approximately 12,248 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be approximately 511 acres. With reclamation and implementation of BMPs as outlined in the SWMP and APDs, potential impacts to groundwater would be largely mitigated. Therefore, cumulative impacts to water quality could be minimal.

### 4.4.5 Noise

The CEAA for noise is the project area. Most of the project area noise levels consistent with sound at outdoor rural residential locations. The single consistent producer of anthropogenic noise is traffic on Interstate-70. Burlington Northern-Santa Fe and Amtrak railroads utilize tracks

on the west side of Interstate-70 and produce noise spatially consistent though relatively infrequent. Noise associated with increased oil and gas activity has increased noise during construction and production. Noise would increase in the project area with implementation of the Proposed Action although noise would be localized.

### 4.4.6 Invasive, Non-native Species

The CEAA for invasive, non-native species is taken as the BLM GJFO portion of fifth-order watersheds affected by project disturbance, for the reasons indicated in Table 4.3-1, an area comprising approximately 315,131 acres. Past and present surface disturbance from analyzed activities within the CEAA is approximately 12,248 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be approximately 511 acres. With monitoring and implementation of the BLM's Noxious and Invasive Weed Management Plan for Oil and Gas Operators (BLM, 2007a) and BMPs, cumulative impacts from invasive, non-native species could be minimal.

### 4.4.7 Sensitive Species (Plant or Animal)

The CEAA for sensitive species is taken as the BLM GFJO portion of CPW Game Management Units 31 and 42, for reasons indicated in Table 4.3-1, an area comprising approximately 421,723 acres. Past and present surface disturbance from analyzed activities within the CEAA is approximately 14,643 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be approximately 590 acres. Cumulative effects to sensitive plant and animals species would be minimal with successful implementation of the Biological Resources Protection Plan.

### 4.4.8 Threatened or Endangered Animal Species

The CEAA for threatened or endangered animal species is taken as the BLM GJFO portion of fifth-order watersheds affected by project disturbance, for reasons indicated in Table 4.3-1, an area comprising approximately 315,131 acres. Past and present surface disturbance from analyzed activities within the CEAA is approximately 12,248 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be approximately 511 acres. Cumulative effects to threatened and endangered animal species under the Proposed Action could be minimal with implementation of measures described in the Biological Resources Protection Plan.

### 4.4.9 Threatened or Endangered Plant Species

The CEAA for threatened or endangered plant species is taken as the combined habitat of DeBeque phacelia and the northern population of *Sclerocactus glaucus,* for reasons indicated in Table 4.3-1, an area comprising approximately 202,708 acres. Past and present surface disturbance from analyzed activities within the CEAA is approximately 7,090 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be approximately 359 acres. With implementation of the measures described in the Biological Resources Protection Plan, effects to Colorado hookless cactus and DeBeque Phacelia should be mitigated and therefore, cumulative effects could be negligible.

### 4.4.10 Vegetation and Forestry

The CEAA for vegetation and forestry is taken as the BLM GJFO portion of fifth-order watersheds affected by project disturbance, for the reasons indicated in Table 4.3-1, an area comprising approximately 315,131 acres. Past and present surface disturbance from analyzed activities within the CEAA is approximately 12,248 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be approximately 511 acres. This

would represent a minimal increase in surface disturbance within the CEAA (1.6 percent), which would be mostly reclaimed over time.

### 4.4.11 Wetlands and Riparian Zones

The CEAA for wetlands and riparian zones is the estimated extent of riparian habitat within fifth-order watersheds affected by project disturbance, for reasons indicated in Table 4.3-1, an area comprising approximately 1,605 acres. Based on NAIP imagery, the average extent of riparian habitat was estimated by buffering (by 200 feet) selected parts of GIS layer depicting existing water bodies. Past and present surface disturbance from analyzed activities within the CEAA is approximately 114 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be approximately 0 acres.

### 4.4.12 Wildlife

The CEAA for wildlife is taken as the BLM GFJO portion of CPW Game Management Units 31 and 42, for reasons indicated in Table 4.3-1, an area comprising approximately 421,723 acres. Past and present surface disturbance from analyzed activities within the CEAA is approximately 14,643 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be approximately 590 acres. This would represent a minimal increase in surface disturbance within the CEAA (1.4 percent), which would be mostly reclaimed over time.

### 4.4.13 Paleontological Resources

The CEAA for paleontological resources is taken as the BLM GJFO portion of the outcrop of the Wasatch Formation, for reasons indicated in Table 4.3-1, an area comprising approximately 277,621 acres. Past and present surface disturbance from analyzed activities within the CEAA is approximately 19,746 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be approximately 481 acres.

### 4.4.14 Visual Resources

For purposes of this analysis, the CEAA for visual resources is assumed to be a 2-mile buffer area around proposed project disturbance, for reasons indicated in Table 4.3-1, comprising an area of approximately 95,675 acres. Past and present surface disturbance from analyzed activities within the CEAA is approximately 4,060 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated at 322 acres. Implementation of measures included in the BLM GJFO Standard COAs and in Section 3.4.4 above, could help minimize potential impacts to visual resources with the intention of minimizing cumulative impacts.

### 4.4.15 Socioeconomics

The CEAA for socioeconomics is Garfield and Mesa counties, for reasons indicated in Table 4.3-1, comprising an area of approximately 4,016,979 acres. Measurement of surface disturbing activities does not directly correlate to nor reasonably quantify cumulative impacts to this resource. The CEAA is the same as that analyzed for direct and indirect effects. No additional cumulative effects are expected.

### 4.4.16 Environmental Justice

The CEAA for Environmental Justice is Garfield and Mesa counties, for reasons indicated in Table 4.3-1, comprising an area of approximately 4,016,979 acres. Surface disturbing activities do not reasonably measure cumulative impacts for this resource. The CEAA is the same as that analyzed for direct and indirect effects with no additional cumulative effects.

### 4.4.17 Transportation and Access

The CEAA for Transportation and Access is Garfield and Mesa counties, for reasons indicated in Table 4.3-1, comprising an area of approximately 4,016,979 acres. Analysis of this resource is limited to existing and reasonably foreseeable development of roads and trails. Such past and present development within the CEAA is approximately 15,109 acres. No road disturbances beyond access roads analyzed as part of oil and gas well disturbance are expected. Some road and route closures in the project area are proposed by the GJFO as Travel Management Planning.

### 4.4.18 Wastes, Hazardous or Solid

The CEAA for hazardous or solid wastes is taken as the BLM GJFO portion of fifth-order watersheds affected by project disturbance, for the reasons indicated in Table 4.3-1, an area comprising approximately 315,131 acres. Past and present surface disturbance from analyzed activities within the CEAA is approximately 12,248 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be approximately 511 acres. With adherence to the BLM GJFO Standard COAs and SPCC Plans, surface spills should be quickly detected, managed and remediated, which would result in few or no cumulative impacts.

### 4.4.19 Prime or Unique Farmlands

The CEAA for prime and unique farmlands is taken as the appropriate portion of those soils located within fifth-order watersheds affected by project disturbance, for reasons indicated in Table 4.3-1, an area comprising approximately 13,415 acres. Past and present surface disturbance from analyzed activities within the CEAA is approximately 561 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be approximately 92 acres.

### 4.4.20 Recreation

The CEAA for recreation is taken as the BLM GFJO portion of CPW Game Management Units 31 and 42, for reasons indicated in Table 4.3-1, an area comprising approximately 421,723 acres. Past and present surface disturbance from analyzed activities within the CEAA is approximately 14,643 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be approximately 590 acres. This would represent a minimal increase in surface disturbance within the CEAA (1.4 percent), which would be mostly reclaimed over time.

### 4.4.21 Special Designations (ACECs, SMAs, etc.)

The CEAA for special designation areas is taken as the BLM GJFO portion of fifth-order watersheds affected by project disturbance, for reasons indicated in Table 4.3-1, an area comprising approximately 315,131 acres. Past and present surface disturbance from analyzed activities within the CEAA is approximately 12,248 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be approximately 511 acres. This would represent a minimal increase in surface disturbance within the CEAA (1.6 percent), which would be mostly reclaimed over time.

### 4.4.22 Wild and Scenic Rivers

The CEAA for wild and scenic rivers is taken as the BLM GJFO portion of fifth-order watersheds affected by project disturbance, for reasons indicated in Table 4.3-1, an area comprising approximately 315,131 acres. Past and present surface disturbance from analyzed activities within the CEAA is approximately 12,248 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be approximately 511 acres. This would

represent a minimal increase in surface disturbance within the CEAA (1.6 percent), which would be mostly reclaimed over time.

### 4.4.23 Wilderness

The CEAA for wilderness is taken as the BLM GJFO portion of fifth-order watersheds affected by project disturbance, for reasons indicated in Table 4.3-1, an area comprising approximately 315,131 acres. Past and present surface disturbance from analyzed activities within the CEAA is approximately 12,248 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be approximately 511 acres. No direct impacts to this resource are expected as a result of the Proposed Action and therefore cumulative effects would be expected to be negligible.

### 4.4.24 Range Management

The CEAA for range management is taken as the BLM grazing allotments affected by project disturbance, for reasons indicated in Table 4.3-1, an area comprising approximately 110,788 acres. Past and present surface disturbance from analyzed activities within the CEAA is approximately 5,068 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be approximately 333 acres. Cumulative impacts to range resources could be minimal with implementation of the BLM GJFO Standard COAs and the measures identified to reduce impacts resulting from the Proposed Action.

### 4.4.25 Wild Horses and Burros

The CEAA for wild horses and burros is taken as the BLM GJFO portion of fifth-order watersheds affected by project disturbance, for reasons indicated in Table 4.3-1, an area comprising approximately 315,131 acres. Past and present surface disturbance from analyzed activities within the CEAA is approximately 12,248 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be approximately 511 acres. This would represent a minimal increase in surface disturbance within the CEAA (1.6 percent), which would be mostly reclaimed over time.

### 4.4.26 Land Tenure, Rights of Way and Other Uses

The CEAA for sensitive species is taken as the BLM GFJO portion of CPW Game Management Units 31 and 42, for reasons indicated in Table 4.3-1, an area comprising approximately 421,723 acres. Past and present surface disturbance from analyzed activities within the CEAA is approximately 14,643 acres. Additional surface disturbance resulting from analyzed foreseeable activities is estimated to be approximately 590 acres. This would represent a minimal increase in surface disturbance within the CEAA (1.4 percent), which would be mostly reclaimed over time.

# CHAPTER 5 - CONSULTATION AND COORDINATION

## 5.1 TRIBES, INDIVIDUALS, ORGANIZATIONS, OR AGENCIES CONTACTED

The BLM has consulted the following individuals, organizations and agencies:

- U.S Fish and Wildlife Service
- Colorado Department of Wildlife
- Colorado State Historic Preservation Office
- Ute Mountain Ute Tribe
- Southern Ute Indian Tribe
- Ute Indian Tribe of the Uintah and Ouray Reservation

## 5.2 INTERDISCIPLINARY REVIEW

Edge Environmental, Inc., an environmental consulting firm, prepared this document under the direction and independent evaluation of the BLM. The BLM, in accordance with 40 CFR 1506.5 (a) and (c), is in agreement with the findings of the analysis and approves and takes responsibility for the scope and content of this document.

**INTERDISCIPLINARY REVIEW**

| NAME | TITLE | AREA OF RESPONSIBILITY |
|---|---|---|
| Julia Christiansen | Natural Resource Specialist | Project Lead, Oil and Gas Surface Management and Permitting |
| Natalie Fast<br>Alissa Leavitt-Reynolds | Archaeologist | Cultural Resources, Native American Religious Concerns |
| Chris Pipkin | Outdoor Recreation Planner | Access, Transportation, Recreation, VRM |
| Jacob Martin | Range Management Specialist | Vegetation, Forestry, Range Management |
| David Scott Gerwe | Geologist | Minerals, Paleontology |
| Alan Kraus | Hazard Materials Specialist | Hazardous Materials |
| Robin Lacy | Realty Specialist | Land Tenure/Status, Realty Authorizations |
| Heidi Plank<br>John Toolen | Wildlife Biologists | T&E Animal Species, Migratory Bird Treaty Act, Terrestrial and Aquatic Wildlife |
| Anna Lincoln | Ecologist | Land Health Assessment, Special Status Plant Species |
| Nate Dieterich | Hydrologist | Soils, Water Quality, Hydrology, Water Rights |
| Lathan Johnson<br>Jeff Phillips | Fire Ecologist<br>Natural Resource Specialist | Fire Ecology, Fuels Management |
| Mark Taber | Weed and Range Management Specialist | Invasive, Non-Native Species (Weeds) |
| Christina Stark | Natural Resource Specialist | Riparian |
| Collin Ewing | NEPA and Environmental Coordinator | Environmental Justice, Prime and Unique Farmlands, Environmental Coordinator |

**Edge Environmental, Inc.**

| Resource/Responsibility | Contact |
|---|---|
| Mary Bloomstran | Project Manager, Wastes, Hazardous or Solid, Mineral Resources |
| Carolyn Last | Document Control |
| Jim Zapert (Carter Lake Consulting) | Air Quality and Climate |
| Susan Connell (Carter Lake Consulting) | Air Quality and Climate |
| Dan Duce | Soils, Prime or Unique Farmlands |
| Nikie Gagnon | Water Resources, Land Tenure, ROW, Other Uses |
| Rebecca Buseck | Invasive, Non-Native Species<br>Vegetation<br>Wetlands and Riparian Zones<br>Special Status Plants |
| Archie Reeve | Migratory Birds<br>Wildlife (Fish, Aquatic and Terrestrial)<br>Special Status Animal Species |
| Josh Moro | Cultural Resources, Paleontological Resources, Visual Resources, Recreation, Special Designations, Wild and Scenic Rivers, Range Management, Wild Horse and Burro, Forest Management, Fire and Fuels |
| Sandra Goodman | Socioeconomics<br>Environmental Justice<br>Transportation/Access |
| Joe Frank (HydroGeo, Inc.) | Groundwater |
| Gabriele Walser (HydroGeo, Inc.) | Surface Water, Water Rights |
| Joseph Thomas | GIS Analysis |
| Joe Fetzer, Petros Environmental | Cumulative Analysis |

## CHAPTER 6 - REFERENCES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