



United States  
Department of  
Agriculture

Forest  
Service

July 2008



# Environmental Assessment

## Federal Coal Lease COC-61209 Modification 4

Paonia Ranger District  
Grand Mesa, Uncompahgre and Gunnison National Forests  
Delta County, Colorado  
Sections 27-28 and 33-34 T.12S. R.91W., 6th PM



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**Federal Coal Lease COC-61209 Modification 4**  
**Environmental Assessment**  
**Paonia Ranger District**  
**Grand Mesa, Uncompahgre and Gunnison National Forests**  
**Delta County, Colorado**

**Lead Agency:** USDA Forest Service

**Cooperating Agencies:** Bureau of Land Management-  
Uncompahgre Field Office

Office of Surface Mining, Reclamation and  
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## SUMMARY

The Grand Mesa, Uncompahgre and Gunnison National Forests together with the Uncompahgre Field Office of the Bureau of Land Management propose to authorize a 560 acre lease modification to federal coal lease COC-61209. The area affected by the proposal includes located on lands managed by the BLM for minerals and the FS for federal surface in SW $\frac{1}{4}$ , S $\frac{1}{2}$ SE $\frac{1}{4}$ , S $\frac{1}{2}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$ , S $\frac{1}{2}$ NW $\frac{1}{4}$ SE $\frac{1}{4}$  Section 27; E $\frac{1}{2}$ SE $\frac{1}{4}$  Section 28; NE $\frac{1}{4}$ NE $\frac{1}{4}$  Section 33; and N $\frac{1}{2}$ N $\frac{1}{2}$  Section 34, Township 12 South, Range 91West, 6th PM. This action is needed to accommodate a proposed mine design change (due to geologic hazards) and ensure recovery of compliant and super-compliant coal reserves.

Four responses were received in response to public scoping. Concerns were expressed primarily related to subsidence and air quality/climate change. No significant impacts will occur to any resource area under the Proposed Action. In many cases, the Proposed Action is indistinguishable from the No Action Alternative with the exception of subsidence. Additional slight impacts may be realized from potential reasonably foreseeable future actions which are subject to further review.

Based upon the effects of the alternatives, the Forest Service responsible official will decide:

- Whether or not to consent to the BLM modifying existing federal coal Lease COC-61209 by adding 560 acres according to the Federal Coal Leasing Amendments Act of 1976; and
- Prescribe conditions (stipulations) needed for the protection of non-coal resources.

The BLM responsible official will decide whether to:

- Adopt the No-Action Alternative (no leasing);
- Adopt the proposed action (lease the coal as applied for by the applicants);
- Adopt an alternative with features of both of the alternatives; or

Adopt the action alternative with additional mitigation measures

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# CHAPTER 1. PURPOSE OF AND NEED FOR ACTION

## 1.0 Document Structure

The Grand Mesa, Uncompahgre and Gunnison National Forest has prepared this Environmental Assessment in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This Environmental Assessment discloses the direct, indirect, and cumulative environmental consequences that would result from the proposed action and alternatives. The document is organized into four chapters:

- *Chapter 1. Purpose and Need for Action:* The chapter includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.
- *Chapter 2. Alternatives, including the Proposed Action:* This chapter provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on significant issues raised by the public and other agencies. This discussion also includes mitigation measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative.
- *Chapter 3. Affected Environment and Environmental Consequences:* This chapter describes the environmental

effects of implementing the proposed action and other alternatives. This analysis is organized by [insert topic (i.e., resource area, significant issues, environmental component)].

- *Chapter 4. Consultation and Coordination:* This chapter provides a list of preparers and agencies consulted during the development of the environmental impact statement.
- *Appendices:* The appendices provide more detailed information to support the analyses presented in the environmental impact statement.
- *Index:* The index provides page numbers by document topic.

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Grand Mesa, Uncompahgre, and Gunnison National Forests Supervisor's Office, Delta, Colorado.

## 1.1 Background

The Bowie No. 2 Mine was built and opened by Bowie Resources during the spring and summer months of 1997 with coal production/development beginning on August 15, 1997. This room and pillar operation began developing a main and sub-main system of underground entries to provide the ventilation, haulage and coal conveyor support for years to come. These entries were driven carefully on projections, held to minimum widths with larger than normal coal pillars left in place to assure adequate support for the life of the mine. The mine switched to longwall production during November 1999 and

currently produces at the rate of 6 million tons per year.

Federal coal lease COC-61209 was filed in 1997 and contained approximately 3403 acres. Mining of this coal lease was limited to underground mining methods with an estimated 24 million tons of recoverable coal. This lease had been modified in 1998 and twice in 2005. Current acreage of COC-61209 is 3343.95 acres.

An application was filed by Bowie Resources Limited (BRL) to modify existing federal coal lease COC-61209 by adding 560 acres. The lease modification application contains National Forest System (NFS) surface lands managed by the Grand Mesa, Uncompahgre, and Gunnison National Forests (GMUG). The coal estate is administered by the Uncompahgre Field Office of the Bureau of Land Management (BLM). The lease modification application will be processed according to procedures set forth in 43 CFR 3432.

The proposed lease modification is located Sections 27-28 and 33-34, Township 12 South, Range 91 West, in Delta County, Colorado (approximately 8 miles north/northeast of Paonia, Colorado), and is shown on the attached map in Chapter 2.

The coal in this lease modification would be accessed and recovered by underground longwall mining methods. BRL applied for this lease modification to compensate for changes in mine design, which were driven by underground hazards associated with local geology.

## **1.2 Purpose and Need for Action**

The GMUG and BLM have identified the need to consider issuing a coal lease modification for federal coal lands immediately adjacent to existing federal coal lease COC-61209. The purpose of the lease modification is to accommodate a change in mine design, and to ensure that compliant and super-complaint coal reserves are recovered.

The BLM, charged with administration of the mineral estate on these Federal lands, is required, by law, to consider leasing Federally-owned minerals for economic recovery. The USDA-Forest Service (FS), as the surface management agency, considers consenting to the BLM leasing reserves underlying lands under its jurisdiction, and prescribes conditions (as stipulations) for the protection of non-mineral resources. This action considers modifying one existing federal coal lease. Under 43 CFR 3432 (as amended by the Energy Policy Act of 2005), the holder of a federal coal lease may apply to modify a lease by up to 960 acres. The federal agencies are responding to an application to modify an existing lease.

The USDI- Office of Surface Mining Reclamation and Enforcement, Western Regional Coordinating Center will participate as a cooperating agency as it is responsible for oversight of mine plans.

The proposed action conforms to the overall guidance given in the GMUG Land and Resource Management Plan, as amended (Forest Plan, 1991) which encourages environmentally sound energy and mineral development, and the BLM Uncompahgre Basin Resource Management Plan (RMP, 1989).

This EA also incorporates by reference previous analysis conducted in the vicinity of the project area:

- 2000. USDA FS ROD/FEIS “North Fork Coal EIS”, Iron Point Coal Exploration License (COC-61945) and Iron Point Coal Lease License (COC-61209)
- 2002. USDA FS, Decision Notice and Finding of No Signification Impact, Modification of Iron Point Coal Exploration License (COCO-61945), and Gob Ventilation Borehole Installation of Iron Point Federal Coal Lease (COC-61209).
- 2002. Alder Creek Coal Exploration License (COC-66126).
- 2004. Iron Point Gulch Exploration License (COC-67703).
- 2005. Spruce Stomp Coal Exploration License (COC-67644).
- 2006. USDA FS, Decision Notice and Finding of No Signification Impact, Terror Creek 2D Seismic Plan (COC-69307).
- 2006. Iron Point Gulch Exploration License (COC-70127).
- 2007. USDA FS, Decision Memo, Bowie Resources Geotechnical Borehole (Hubbard Creek).
- 2007. USDA FS, Decision Memo, Bowie Resources Hubbard Creek Ventilation / Emergency Escape Shaft.

- 2008. COC-61209, Thirteen Gob-vent Boreholes (TR-52).
- Spruce Stomp Coal Exploration License (COC-72069).
- Jeep Trail Coal Exploration License (COC-72168).

Applications for lease modifications were specifically identified as a foreseeable action in the final EIS completed in March 2000 for the Iron Point Coal Exploration License, the Iron Point Coal Lease Tract and the Elk Creek Coal Lease Tract.

### 1.3 Proposed Action

The proposed action is to modify BRL’s existing federal coal lease COC-61209 by adding 560 additional acres to it to compensate for changes in mine design, which were driven by underground hazards associated with local geology, and to ensure that federal coal reserves are not bypassed.

### 1.4 Authorizing Actions

#### **Mining and Minerals Policy Act of 1970 and Mineral Leasing Act of 1920**

The Forest Service and BLM manage their minerals programs under guidance given in the Mining and Minerals Policy Act of 1970 which states in part that it is the “continuing policy of the federal government in the national interest to foster and encourage private enterprise in... (t)he development of economically sound and stable domestic mining minerals and mineral reclamation industries...(and) the orderly and economic development of domestic mineral resources....” Further, federal mineral leasing follows the Mineral Leasing Act of 1920 as amended by the Federal Coal Leasing Amendments Act of 1976 (MLA), and specific procedures set forth in 43 CFR 3400.

This lease modification application will be processed according to procedures set forth in 43 CFR 3432. Lease modifications are considered non-competitive leasing actions, as they are applied for by lease holders to add acreage to an existing lease. In this case, BRL has applied for this modification. No other coal company could obtain the rights to the coal in this lease modification if it is approved.

The subsequent permitting action to allow mining and changing of the approved mine permit boundary to include the modification areas would be evaluated by the Colorado Division of Reclamation Mining Safety (DRMS) under procedures set forth in 30 CFR 700 et. seq. and the Regulations of the Colorado Mined Land Reclamation Board for Coal Mining.

These changes would also require approval from the USDI through the Office of Surface Mining Reclamation and Enforcement (OSM).

#### **Surface Mining Control and Reclamation Act of 1977**

The Surface Mining Control and Reclamation Act of 1977, as amended, (SMCRA) gives OSM primary responsibility to administer programs that regulate surface coal mining operations and the surface effects of underground coal mining operations in the United States. Pursuant to Section 503 of SMCRA, e DRMS developed, and the Secretary of the Interior approved, Colorado's permanent regulatory program authorizing DRMS to regulate surface coal mining operations and the surface effects of underground coal mining on private and State lands within the State of Colorado.

In September 1982, under Section 523(c) of SMCRA, DRMS entered into a cooperative agreement with the

Secretary of the Interior authorizing DRMS to regulate surface coal mining operations and the surface effects of underground coal mining on Federal lands within the State.

Based on the cooperative agreement, Federal coal lease holders in Colorado must submit a permit application package to OSM and DRMS for proposed mining and reclamation operations on Federal lands in the State. DRMS reviews the package to ensure that the permit application complies with the permitting requirements and that the coal mining operation will meet the approved permanent program's performance standards. If it does comply, DRMS issues the applicant a permit to conduct coal mining operations. OSM, BLM, the Forest Service, and other Federal agencies review the permit application package to ensure that it contains the necessary information for compliance with the coal lease, the MLA, NEPA and other applicable Federal laws and their attendant regulations. Before the mining plan can be approved, OSM obtains input from BLM and the surface-managing agency (if other than BLM). OSM then recommends either approval, approval with conditions, or disapproval of the MLA mining plan to the Assistant Secretary of the Interior, Land and Minerals Management

DRMS enforces the performance standards and permit requirements during the mine's operation and has primary authority in environmental emergencies. OSM retains oversight responsibility for this enforcement. BLM and the surface management agency (in the case the Forest Service) have authority in emergency situations in which DRMS or OSM inspectors cannot act before environmental harm or damage occurs.

## 1.5 Decision Framework

### Forest Service

The GMUG Forest Supervisor is the NEPA Responsible Official for the Forest Service. Given the purpose and need, the Responsible Official will review the proposed action, the other alternatives, and the environmental consequences in order to decide the following:

- Whether or not to consent to the BLM modifying existing federal coal Lease COC-61209 by adding 560 acres according to the Federal Coal Leasing Amendments Act of 1976; and
- Prescribe conditions (stipulations) needed for the protection of non-coal resources.

The Forest Service Responsible Official will determine if the activity is consistent with the GMUG Forest Plan.

### BLM

The BLM Colorado State Director is the deciding official for the BLM, and will decide whether or not to modify the existing coal lease under the MLA, as amended, and the federal regulations under 43 CFR 3400. The Uncompahgre Field Office Manager is responsible for providing the State Director with briefings and recommendations. Specifically, the BLM will decide whether to:

- Adopt the No-Action Alternative (no leasing);
- Adopt the proposed action (lease the coal as applied for by the applicants);
- Adopt an alternative with features of both of the alternatives; or
- Adopt the action alternative with additional mitigation measures.

### OSM

OSM is a cooperating agency. OSM will prepare any MLA mining plan decisions related to this lease.

## 1.6 Conformance with Land Use Plans

### Forest Plan Consistency

The amended Land and Resource Management Plan (LRMP) dated September 1991, for the GMUG National Forests made provisions for coal leasing subject to the application of the coal unsuitability criteria established in 43 CFR 3461. (See *Appendix A Unsuitability Analysis Report*) The LRMP also provided for applicable stipulations to be utilized for protection of specific surface resources as addressed in Section III, General Direction, pages 63-69 of the LRMP.

The Forest Plan guides all natural resource management activities and establishes management standards and guidelines for the GMUG. Management directions described in the Forest Plan are a result of public issues, management concerns, and management opportunities. Multiple use management area prescriptions as designated in the Forest Plan (pages 111-114 to 187) for the lands bounded by the proposed lease tract is summarized below:

- 4B -Wildlife habitat management for one or more management indicator species. Emphasis is on optimizing habitat capability for management indicator species. Other resource activities may occur, as long as habitat requirements are maintained.
- 9A-Riparian / Aquatic Ecosystems. Emphasis is on the management of all the

components of aquatic/riparian ecosystems to provide healthy, self-perpetuating plant communities, acceptable water quality standards, habitats for viable populations of fish and wildlife, and stable stream channels and still water body shorelines. Mineral activities may occur but must minimize disturbance to riparian areas and initiate timely and effective rehabilitation of disturbed areas and restore them to a state of productivity comparable to that before disturbance.

### **BLM Resource Management Plan Consistency**

The proposed action is in compliance with the existing BLM land use plan. The Uncompahgre Basin Resource Management Plan (RMP) was completed, and approved in July of 1989. This RMP determined that the areas subject to the lease applications and exploration license applications were to be managed for both existing and potential coal development. The area is acceptable for coal development and coal production, and such coal activities could occur without conflicting with other land uses as described in the RMP. Upon receipt of the lease applications, BLM completed tract delineation. The assessment of coal unsuitability criteria has been completed for the proposed lease modification. The criteria have also been reviewed for implications with the other alternatives in this analysis. The unsuitability criteria published in 43 CFR 3461 were used. This coal unsuitability analysis report is included in this EA document as *Appendix A Unsuitability Analysis Report*. In addition, data adequacy standards were reviewed and determined to be adequate.

The land use plan was amended to address the standards for land health (i.e., Standards and Guidelines). The land analyzed in the EA project area is within the North Fork landscape unit. Briefly, Colorado BLM's Standards are:

- Ensure health of upland soils;
- Protect and improve riparian systems;
- Maintain healthy, productive plant and animal communities;
- Maintain or increase populations of threatened and endangered species in suitable habitat; and
- Ensure water quality meets minimum Colorado standards.

The proposed action deals primarily with underground mining. Only minor surface disturbing activities would occur on BLM managed lands. Consequently, there is little potential for actions to have a significant effect (positive or negative) to the landscape as a whole. There would be local effects where surface disturbing activities occur. For example, there would be increased potential for soil erosion and influx of weeds. It is assumed mitigation would avoid or lessen the impact. If any permitted activities are found to affect land health, then modifications to operations as authorized by BLM will occur.

### **1.7 Public Involvement**

The Notice of Opportunity to Comment was published in the Grand Junction Daily Sentinel on April 4, 2004. The notice asked for public comment on the proposal for 30 days following publication. In addition, as part of the public involvement process, Forest Service and BLM met with Colorado Division of Wildlife, US Environmental Protection Agency, Office of Surface Mining and Reclamation and Colorado Division of Reclamation Mining; and sent scoping letters to approximately 85



groups, individuals and agencies. Four comment letters were received.

Using the comments from the public, other agencies, and the interdisciplinary team, all the issues brought up are addressed in the following sections: Key Issues, Non-key Issues, or Alternatives Considered but Eliminated from Detailed Study.

## 1.8 Issues

The Forest Service and BLM have separated the issues into two groups: key and non-key issues. Key issues were defined as those directly or indirectly caused by implementing the proposed action. Non-key issues were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. The Council on Environmental Quality (CEQ) NEPA regulations explain this delineation in Sec. 1501.7, "...identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)..." A list of non-key issues and reasons regarding their categorization as non-significant is also found below.

### 1.8.1 Key Issues (Carried Forward in the Analysis)

Issues relating to the proposed lease modifications were identified and based on the comments received during the public scoping process. These issues, along with issues raised by the Interdisciplinary Team (IDT), were carried forward in the EA analysis. The issues carried forward are listed below.

- Cumulative effects including:

- Surface disturbance that will likely occur as a result of mining (in addition to subsidence). **See Chapter 3 and Section 3.1.**
- Reasonably foreseeable impacts to the surface and other resources. **See Chapter 3 and Section 3.1.**
- Impacts from Oxbow and Bowie mining activities including effects to Hubbard Creek, Dove Gulch, Iron Point Gulch, and Hubbard Creek Canyon. **See section 3.11.**
- Effects on climate change including analysis of release of methane from mine mouth or through the mine ventilation system, release of methane through any gob vent boreholes and release of CO<sub>2</sub> caused by the burning of coal that is mined. **See Section 3.2 and 3.3.**
- Impacts to Canada lynx. **See Section 3.16.**
- A reasonably complete discussion of mitigation measures should be addressed. **See Chapter 3 (especially Section 3.3).**
- Impacts to the area's visual quality objectives (FP III-115). **See sections 3.31 and 3.32.**
- Effects of subsidence on:
  - Water resources including local water quality and quantity in Hubbard Creek. **See Chapter 3 Surface and Ground Water.**
  - Wildlife habitat, including effects to riparian habitat. **See Chapter 3 Vegetation and Wildlife Sections.**
  - Cultural resources. **Sections 3.24 and 3.25.**

- Other land uses, including range improvements, cattle trails and other multiple uses of the land. **See Sections 3.1, 3.23 and 3.24.**
- Effects of adding coal reserves on coal resource recovery. **See Sections 3.27 and 3.28 and Appendix C.**
- Effects of the proposed action on air quality. **Sections 3.2 and 3.3.**
- Effects on Terror Creek dam. **Section 3.11.**

### **1.8.2 Non-Key Issues (Not Carried Forward In the Analysis)**

- A stipulation to prevent surface disturbance throughout the lease modification area will not be considered. *There is no rationale given with which to consider this request and, further, has already been decided by Forest Plan direction and parent lease language. Additionally, effects from an alternative that considers prevention of future disturbance is already covered by consideration of the No Action Alternative and the Proposed Action. CEQ NEPA regulations describe this situation as having been covered by prior environmental review (Sec. 1506.3).*
- A stipulation to prevent surface disturbance on steep slopes has already been considered. *This stipulation will be carried forward from the parent lease.*
- A stipulation to prevent surface disturbance in riparian areas has already been considered. *This stipulation will be carried forward from the parent lease.*

- A stipulation to prevent surface disturbance within ½ mile of Hubbard Creek was recommended. *As no specific reason has been given for this recommendation and is not supported by analysis, the stipulations will be carried forward from the parent lease which directs that 1/8 of a mile buffer zone be applied to Hubbard Creek and no mining that would cause subsidence under Hubbard Creek would be permitted.*
- Effects of adding coal reserves on coal transportation. *The coal from the lease modification area would be transported using BRL's existing coal transportation facilities. The amount of coal reserve available in the lease modifications would not change the transportation system but may slightly increase the number of trains transporting coal (additional 14 train loads for the life of the reserves). Further, no increase in annual production is proposed with the addition of the lease modifications.*
- Impacts to recreational use of non-motorized trail in and around Hubbard Creek. *There are no non-motorized system trails around Hubbard Creek that will be impacted by this project (all trails are outside of possible subsidence zone) or impacted by any potential reasonably foreseeable development.*

## **1.9 Other Related Efforts**

BRL has been operating the Bowie Mine No. 2 since 1997 and produces approximately 6 million tons of coal per

year. BRL currently holds 6 federal coal leases, covering about 10,722 acres of combined BLM, Forest Service and private land. BRL started recovering coal using the longwall method in 1999 and uses it for primary production.

The reasonably foreseeable development scenario for this lease modification includes re-orienting three longwall panels (see map Appendix B) to compensate for coal reserves lost due to coal bumps and other geologic problems. The modification for lease COC-61209 would involve re-orienting the B seam panels 9, 10 and 11 to avoid geologic faulting and other mining hazards (i.e., coal bumps). Additional reasonably foreseeable future development related to mining activities is described at the beginning of Chapter 3.

The only surface disturbance associated with this lease modification would be that incident to subsidence (see Chapter 3 for a discussion of effects). No other surface disturbing activities are proposed. However, a discussion showing other past, present and reasonably foreseeable future actions with regard to other forest activities and resources is given in Section 3.1 and in analysis of cumulative effects provided throughout Chapter 3.



# CHAPTER 2. ALTERNATIVES, INCLUDING THE PROPOSED ACTION

## 2.0 Introduction

This chapter describes and compares the alternatives considered for the Federal Coal Lease COC-61209 Modification 4. It includes a description and map of the action alternative considered. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision makers. Information used to compare the alternatives is based upon the environmental, social and economic consequences of implementing each alternative.

## 2.1 Alternatives Considered in Detail

The Forest Service developed two alternatives, including the No Action and Proposed Action alternatives, in response to issues raised by the public.

### 2.1.1 Alternative 1-No Action

Analysis of the No Action alternative is required by CEQ 40 CFR Part 1502.14(d). Under the no action alternative, the lease modification would not be approved, and no mining would occur in this specific area. Impacts from mining coal under this area would not occur on these lands, and the effects from on-going land uses would continue

including coal mining activities such as exploration and monitoring related to other lease activities. The land would continue to be managed according to Forest Plan standards, goals and guidelines.

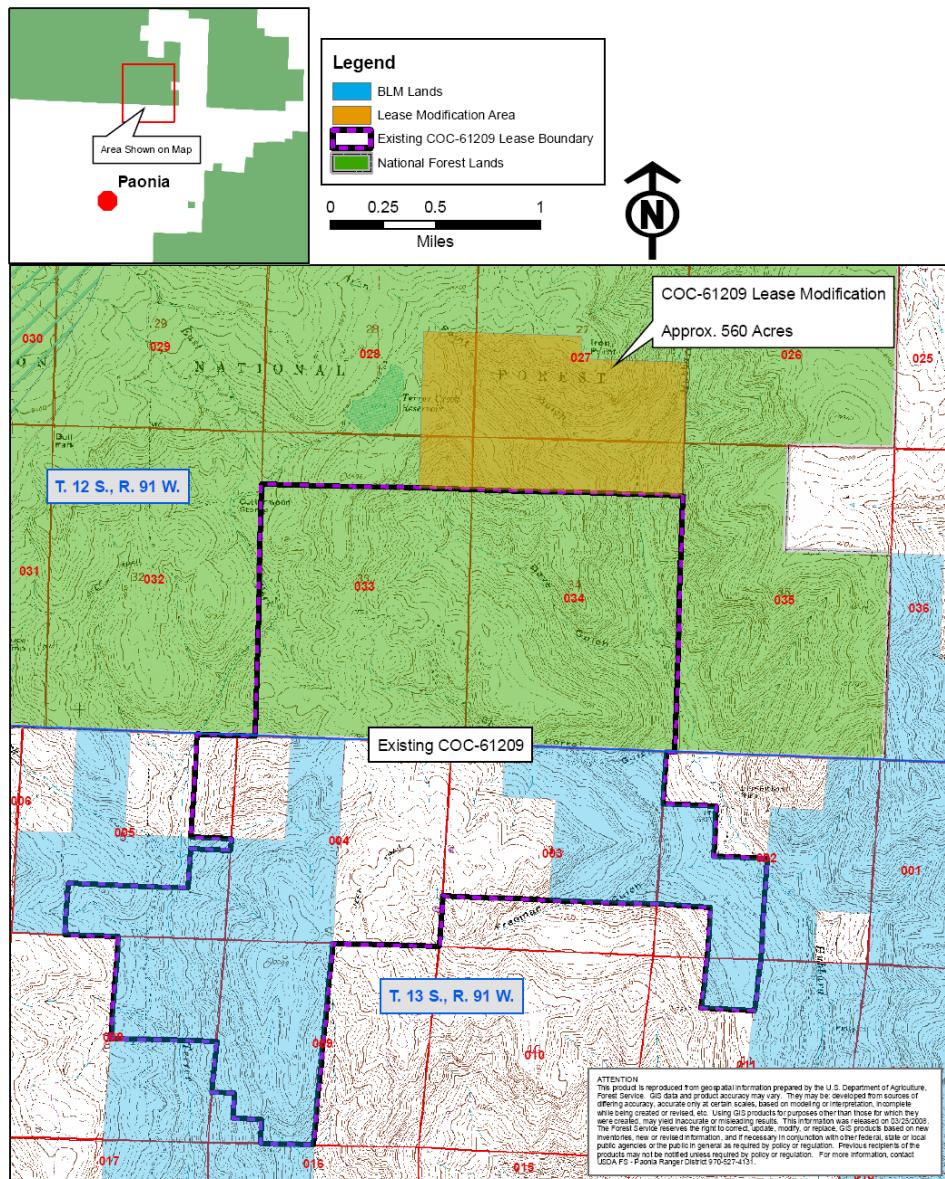
### 2.1.2 Alternative 2-The Proposed Action

The proposed action is to modify BRL's existing federal coal lease COC-61209 by adding 560 additional acres to it to compensate for changes in mine design, which were driven by underground hazards associated with local geology, and to ensure that federal coal reserves are not bypassed.

The proposed lease modification consists of approximately 560 acres located on lands managed by the BLM for minerals and the FS for federal surface in SW<sup>1</sup>/<sub>4</sub>, S<sup>1</sup>/<sub>2</sub>SE<sup>1</sup>/<sub>4</sub>, S<sup>1</sup>/<sub>2</sub>NE<sup>1</sup>/<sub>4</sub>SE<sup>1</sup>/<sub>4</sub>, S<sup>1</sup>/<sub>2</sub>NW<sup>1</sup>/<sub>4</sub>SE<sup>1</sup>/<sub>4</sub> Section 27; E<sup>1</sup>/<sub>2</sub>SE<sup>1</sup>/<sub>4</sub> Section 28; NE<sup>1</sup>/<sub>4</sub>NE<sup>1</sup>/<sub>4</sub> Section 33; and N<sup>1</sup>/<sub>2</sub>N<sup>1</sup>/<sub>2</sub> Section 34, Township 12 South, Range 91 West, 6th PM.

The proposed action deals primarily with underground mining. It is assumed that longwall mining practices would be used. Only minor surface disturbing activities would occur on Forest Service lands as a result of subsidence.

Figure 2.1.2. Proposed Lease Modification 4 to COC-61209.



### **2.1.3 Stipulations for Action Alternative**

The Forest Service and BLM also developed the following stipulation measures to be used as part the action alternative.

#### **2.1.3a Stipulations Carried Forward from Parent Lease (COC-61209) Specific to Forest Service Lands**

##### **Subsidence**

Mining that would cause subsidence will not be permitted under perennial portions of Terror Creek, Hubbard Creek and Dove Gulch. Further mining that would cause subsidence will not be permitted within a zone under these drainages created by projecting a 25 degree angle of draw (from vertical) from the surface expression of the creeks down to the top of the coal seam to be mined.

##### **Surface Disturbance**

Specific approval would be required for locating drill sites, degasification boreholes or ventilation shafts or any other surface disturbances (if they are needed) in areas of moderate geologic hazards and on slopes ranging from 40 to 60 percent.

##### **Steep Slopes**

Drill sites, degasification boreholes, ventilation shafts or any other surface disturbances would not be located on slopes in excess of 60 percent, or in areas of high geologic hazard.

##### **Wetlands, Floodplains & Riparian**

No surface occupancy or use would apply to all wetlands, floodplains, and riparian areas on the National Forest.

### **Big Game Winter Range**

With regard to protecting elk on the winter range and minimizing surface damage, no surface use (exploration, drilling, and development activity) would be allowed from October 1 through May 15, or whenever conditions in the spring allow operations without causing surface damage. Operations between October 1 and the Friday preceding regular big game hunting season may be allowed during dry weather upon written authorization of the Forest Service.

#### *Access Roads*

If new road access is required for the construction of degasification boreholes or ventilation shafts, access would be obliterated. Until obliteration, all new access will be closed to the public. Long term access will be by foot and horse.

The lessee shall provide for the suppression and control of fugitive dust on roads used by the lessee.

#### **Transportation of Coal**

The lessee would be required to comply with BLM stipulations regarding transport of coal from the lease.

#### **Baseline Data & Monitoring**

The lessee shall be required to perform a study to secure adequate baseline data to quantify existing surface resources, on and adjacent to the lease area. Existing data may be used if such data are adequate-for the intended purposes. The study shall be adequate to locate, quantify, and demonstrate the interrelationship of the geology, topography, surface hydrology, soils, vegetation and wildlife. Baseline data will be established so that future programs of observation can be incorporated at regular intervals for comparison.

The lessee shall be required to establish a monitoring system to locate, measure and quantify any progressive and final effects of underground mining activities on the topographic surface, subsurface and surface hydrology, soils and vegetation. The monitoring system shall utilize techniques which will provide continuing record of change over time and an analytical method for location and measurement of a number of points over the lease area.

#### **Other Rules and Regulations**

The licensee/permittee/lessee must comply with all the rules and regulations of the Secretary of Agriculture set forth at Title 36, Chapter II of the Code of Federal Regulations governing the use and management of the National Forest-System. (NFS) when not inconsistent with the rights and regulations must be complied with for:

- a. All use and occupancy of the NFS prior to approval of a permit/operation plan by the Secretary of the Interior;
- b. Uses of all existing improvements, such as Forest development roads, within and outside the area licensed, permitted or leased by the Secretary of the Interior; and
- c. Use and occupancy of the NFS not authorized by a permit/operating plan approved by the Secretary of the Interior.

#### **2.1.3b Stipulations Carried Forward from Parent Lease (COC-61209)**

##### **Cultural and Paleontological Resources**

Prior to any surface disturbing activities, including subsidence, the lessee shall conduct a cultural resources survey and paleontological assessment of all previously unsurveyed areas that will be directly impacted by operations under

this lease. The survey shall be an intensive field inventory of cultural, historical, and archaeological values, including, but not limited to, any and all objects of antiquity, historic or prehistoric ruins and artifacts, or other specimens of scientific interest. If the paleontological assessment demonstrates a need for site-specific inventory, this survey will also be performed. This is further detailed in the parent lease for COC-61209.

##### **Threatened and Endangered Species**

If there is reason to believe that new individuals or populations of Threatened or Endangered or Sensitive (TES) species of plants or animals, or migratory bird species of high Federal interest occur in the area, the lessee shall be required to conduct an intensive field inventory of the area to be disturbed and/or impacted. The inventory shall be conducted by a qualified specialist and a report of findings will be prepared. A plan will be prepared making recommendations for the protection of these species or action necessary to mitigate the disturbance. The cost of conducting the inventory, preparing reports and carrying out mitigating measures shall be borne by the lessee.

##### **Birds**

To protect and preserve breeding and nesting habitat for the loggerhead shrike and other neo-tropical birds, disturbances in sagebrush, Gambel oak stands, and riparian areas will be avoided to the extent practicable.

No surface disturbance or facilities will be located in occupied southwest willow flycatcher habitat. Prior to any planned disturbance within riparian habitats on the lease, the lessee must:

- Survey the area of the proposed disturbance for suitable



southwest willow flycatcher habitat, and survey all suitable habitat for the presence of the species. All habitat and species surveys must be in accordance with the accepted USFWS protocol;

- Provide the results of all surveys to the USFWS, the Uncompahgre Field Office of BLM, and the Paonia Ranger District;
- If suitable habitat or individuals are located in the area, consultation with the USFWS will be required to determine suitable conservation measures to prevent a “take” under Section 9 of the Endangered Species Act. Conservation measures may include avoidance of the occupied habitat, establishment of a buffer zone and seasonal restriction around the occupied habitat, or others developed for the specific site. In accordance with current year protocol, surveys for the presence of the species are valid for only one year.

### **Raptors**

With respect to bald or golden eagle nests which may be established on the Iron Point lease during the life of the project, the following shall apply:

- No new permanent surface facilities or disturbances shall be located within ¼ mile radius buffer zone around each bald or golden eagle nest site.
- No above ground activities will be allowed within ½ mile radius buffer zone around each active eagle nest site from November 15 to July 30 for bald eagles and around each active golden eagle nest site from February 1 to July 15.

- Any proposed surface facilities, disturbances or activities (note above) in or adjacent to these buffer zones will require approval from the BLM or Forest Service on a site-specific basis, after consultation with the USFWS.
- With respect to bald eagle winter roost sites or concentration areas which may become established on the Iron Point lease during the life of the project, the following special stipulations shall apply:
- No above ground activities will be allowed within ¼ mile radius of winter roosts between November 15 and March 15; development may be permitted at other periods. If periodic visits are required within the buffer zone after development, activities should be restricted to the hours of 10:00 am and 2:00 pm from November 15 through March 15.

With respect to other raptors (except American kestrels) which may occur or become established on the Iron Point lease during the life of the project, the following special stipulations shall apply:

- Conduct surveys for nesting raptors on the lease tract prior to development of any surface facilities.
- No surface activities will be allowed within ½ mile radius of active nest sites between the dates of February 1 and October 15, unless authorized by BLM or Forest Service on a site-specific basis.

### **Big Game Winter Range**

With respect to mule deer and elk crucial winter range that may be established by

Colorado Division of Wildlife on BLM managed lands on the Iron Point lease during the life of the project, the following shall apply:

- Coal related facilities and surface disturbances except subsidence will be authorized in the review area only in no practical alternatives exist. The BLM will coordinate with the CDOW to determine the type an extent of allowable variances. Coal exploration, facility construction, and major scheduled maintenance will not be authorized within these crucial winter ranges from December 1 through April 30. All unavoidable surface disturbances within these crucial winter rangers during these times will require approval of the authorized officer.

#### **Water Replacement Plan**

Lessee shall replace in a manner consistent with State law the water supply of any owner of a vested water right which is proximately injured as a result of the mining activities.

Lessee will conduct an inventory of all existing water sources (including gain/loss analysis on both Terror and Hubbard Creeks) adjacent to, originating on or flowing over the lease tract (including State adjudicated water rights, stock ponds, springs, etc.) which may be impacted by subsequent mining activities. At a minimum, this inventory will include: the water right holder, location, source, amount of decrease, beneficial use, current and historical flow (including seasonal/annual variation), and the appropriation and adjudication dates.

In addition to the water inventory, the lessee shall be required to establish a water resource monitoring program to locate, measure and quantify the progressive and final effects of underground mining activities on the water resources potentially affected by mining. Monitoring of water resources would continue until a determination is made by the DRMS that there would be no injury to water resources.

Lessee shall formulate a water replacement plan to replace possible loss of water resulting from mining activity of the Iron Point lease.

- The water replacement plan will include all existing water sources, including those presently adjudicated and historically put to beneficial use in the Terror Creek and Hubbard Creek drainages.
- The water replacement plan for the respective drainages shall be developed after consultation with affected water right users and Federal and State authorities, and shall be approved by State authorities before mining in the particular drainage.
- At a minimum, the water replacement plan will require, upon injury, replacement of water of suitable quality and water right seniority to provide for all existing uses (including sources supporting livestock and ecosystem, and other land uses as authorized by 36 CFR 251) and be delivered to existing points of diversion in a timely manner.
- As part of each water replacement plan, the lessee shall demonstrate its legal and physical ability to implement said plan. A source of replacement water may include,

but is not limited to, the transfer of water rights, an augmentation plan, a long-term water use lease, or compensatory storage.

Fueling and lubricating vehicles are prohibited within 100 feet of streams and wetlands. No fuel storage is allowed within 500 feet of any water bodies.

#### **Riparian Zones**

A 1/8 mile buffer zone (660 feet) will be protected on either side of the riparian zones (or a buffer zone may be established in accordance with the surface management agency guidelines). No surface disturbances, except surface subsidence, will be permitted within these buffer zones unless no practical alternatives exist. All unavoidable surface disturbances will require approval of the BLM and/or Forest Service authorized officer. The BLM or Forest Service will coordinate with the USFWS and CDOW to determine the type and extent of allowable variances. A site-specific analysis will determine if this stipulation will apply.

#### **Road Right-of-Way**

No mining related disturbances will occur within 100 feet of the outside line of the right of way of Hubbard Creek County Road (44.05 Drive) as identified in Unsuitability Criterion 3 ("North Fork EIS" 2000). The angle of draw used to protect the road from subsidence will be dictated by the approved DRMS Mine Permit Application Package (the estimated angle of draw is conservatively estimated to be 25 degrees). However, mining related disturbances may occur if, after public notice and the opportunity for public hearing in the locality, a written finding is made by the BLM authorized officer that the interests of the public and the landowners affected by mining within

100 feet of a public road will be protected.

#### **Subsidence**

Except at specifically approved locations, mining that would cause subsidence will not be permitted within a zone under Terror Creek, Hubbard Creek and the Curecanti-Rifle 230/345 power line. The zone is determined by projecting a 25 degree angle of draw (from vertical) from the surface expression of the creeks and power line down to the top of the coal seam to be mined.

The lessee shall be required to perform a study to establish baseline conditions, potential mining-induced seismicity and potential translated effects to the Bruce Park (Terror) Reservoir and Dam. The study will be completed prior to any underground mining activity (including subsidence) within 1 mile of the Bruce Park Reservoir and Dam. The lessee shall also be required to establish a seismic monitoring program to locate, measure and quantify any progressive and final effects of underground mining activities on the Bruce Park Reservoir.

The monitoring system shall utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a number of points over the lease area. The study and monitoring program shall be developed in consultation with the Dam Safety Engineer, Colorado State Engineer's Office, Water Division 4, and appropriate affected parties.

Existing or permitted surface improvements will need to be protected, restored or replaced to provide for continuance of current land uses. With specific regard to the Bruce Park

Reservoir and Dam, should structural damage result from mining-related activities, the lessee shall be responsible for damage, repair and compensation to the injured party or parties.

The structural integrity of the coal in the chain and barrier pillars under Terror and Hubbard Creeks shall be designed and maintained for long-term support. Backfilling or structural supports may be required to achieve long-term support under the creeks and the structure upon retreat mining. A pillar stability analysis shall be used to design chain or barrier pillars for long-term structural integrity where needed to protect surface resources.

#### **Surface Disturbing Activities**

Any surface disturbance related to installation of degasification boreholes, ventilation shafts, drill holes or any other surface-disturbing activity must be approved by the surface management agency. The lessee/operator will be responsible for soil preservation/protection and final reclamation. For reclamation that would require reseeding, a certified weed-free source of seed would be used. The lessee will be responsible for controlling spread of and eradicating noxious weeds.

#### **2.1.3c New Stipulations Specific to Lease Modification**

##### **Colorado River Fish**

In the future, if water used for mine related activities exceeds a depletion amount previously consulted upon by the GMUG, the permitting agency must enter into consultation with the U.S. Fish and Wildlife Service to determine appropriate conservation measures to offset effects to listed fish and critical habitat in the upper Colorado River Basin.

#### **Golden Eagles**

There is a known golden eagle nest near Terror Reservoir. This site will need to be monitored for activity.

## **2.2 Alternatives Considered but Eliminated from Detailed Study**

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Public comments received in response to the Proposed Action provided suggestions for alternative methods for achieving the purpose and need. Some of these alternatives may have been outside the scope of considering consenting to the issuance of a coal lease modification for federal coal lands immediately adjacent to existing federal coal lease COC-61209 for the purpose of accommodate a change in mine design, duplicative of the alternatives considered in detail, or determined to be components that would cause unnecessary environmental harm. Therefore, a number of alternatives were considered, but dismissed from detailed consideration for reasons summarized below.

#### **2.2.1 Reduce the potential greenhouse gas emissions of the project including flaring and methane capture.**

Alternatives that address flaring and methane capture are duplicative of the Proposed Action as these are possible mitigation measures that may be implemented if the coal is mined in this particular area.

**2.2.2 Vent all methane through mine mouth**

An alternative that addresses venting all methane through mine mouth (this analysis refers to this as main mine fan) is duplicative of the No Action and Proposed Action as this is addressed in the Air Quality analysis section.

**2.2.3 Prevent future disturbance for road construction, drill pads and the like.**

Effects from an alternative that considers prevention of future disturbance is already covered by consideration of the No Action Alternative and the Proposed

Action. CEQ NEPA regulations describe this situation as having been covered by prior environmental review (Sec. 1506.3).

**2.3 Comparison of Alternatives**

This section provides a summary of the effects of implementing each alternative. Information in the table is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives.

**Table 2.3. Comparison of Alternatives**

| Topic                             | Alternative 1-No Action  | Alternative 2-Proposed Action  |
|-----------------------------------|--|--|
| Air Quality                       | Continued effects from existing activities.  | No measurable change over No Action.   |
| Water Quality and Quantity        | Continued effects from existing activities   | No change noticeable over No Action.   |
| Topography, Geology & Soils       | Continued effects from existing natural and human-caused activities Subsidence will <u>not</u> occur in the lease modification area.   | Subsidence will occur in lease modification area.  |
| Threatened and Endangered Species | No effect on Canada Lynx. May affect likely to adversely affect 4 Big River Endangered Fish due to the cumulative nature of water depletions. No effect on Greenback cutthroat trout.  | Same as No Action.   |
| Management Indicator Species      | Selection of the No Action Alternative would not change current habitat or population conditions in the short-term. Long-term changes would continue to be dependent on existing conditions, succession of vegetative types and other actions. | Selection of the Proposed Action Alternative would not change current habitat or population conditions in the short-term. Long-term changes would continue to be dependent on existing conditions, succession of vegetative types and other actions. All effects are the result of reasonably foreseeable future potential development and not the |

| Topic                         | Alternative 1-No Action  | Alternative<br>Action   | 2-Proposed  |
|-------------------------------|--|---|---|
| Sensitive Species             | No human-caused change in existing condition of current vegetation and habitat is anticipated in the project area. | lease itself. See Section 3.17.2 for species specific effects.  | No human-caused change in existing condition of current vegetation and habitat is anticipated in the project area. Reasonably foreseeable future potential development may impact individuals or habitat, but will not likely contribute to a trend towards federal listing for all species |
| Cultural & Heritage Resources | No effect.   | No effect.  |   |
| Visual Resources              | No effect.   |   | Un-noticeable minor effects as a result of subsidence may occur.  |
| Coal Resource Recovery        | Mining at Bowie No. 2 will continue to recover coal resources.   | Proposed action changes the mining design to allow more efficient recovery. A slight increase in coal recovered will be realized. |   |

# CHAPTER 3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

## 3.0 Introduction

This Chapter summarizes the physical, biological, social, and economic environments of the project area and the environmental consequences of implementing each alternative on that environment. It also presents the scientific and analytical basis for the comparison of alternatives presented in the alternatives chapter.

### Short-term and Long-term Effects

Unless otherwise specified, short-term is the life of the project. Long-term effects are defined as those that would occur after coal is mined.

### Direct and Indirect Effects

Direct effects are caused by the action and occur at the same time and place as the action. Indirect effects are caused by the action and occur later in time or farther removed in distance, but are still reasonably foreseeable. Direct and indirect effects analysis for each alternative and each resource are based on description of the alternatives provided in Chapter 2, including conditions of approval and assumes all would be implemented as described.

### Cumulative Effects

Cumulative impacts are impacts on the environment that result from incremental impact of the action when added to other past, present, and reasonably foreseeable future actions.

## 3.1 Past, Present and Reasonably Foreseeable

## Actions

### General Background

Coal mining has been one of the dominant land uses in the North Fork of the Gunnison River area. Underground mining has occurred in this area for the past 100 years. Coal mining has occurred on both private and public lands in the general area. There are currently three operating coal mines in the North Fork Valley. These are the Bowie No. 2 Mine, the Sanborn Creek Mine, and the West Elk Mine. The Bowie No. 1 Mine is currently idle under provisions of a temporary cessation approval from the Colorado DRMS. There was no coal production from this mining operation in 1998. Coal exploration is occurring in the area in conjunction with actual coal mining operations. Such exploration activities have been undertaken to identify and delineate recoverable coal deposits. These activities generally involve drilling holes to delineate the coal reserves and evaluate coal quality. Exploration activities have occurred on National Forest System lands and BLM administered lands under plans of operation and subsequent amendments approved by the BLM and the Forest Service. There has also been coal exploration and development on private lands. All exploration activities, whether on federal or private lands, must be permitted with the Colorado DRMS.

### Bowie No. 2 Mine

The mine has been operating for 11 years and holds over 10,000 acres of Federal coal leases. Subsidence on the

GMUG and BLM lands has occurred in and immediately adjacent to the project area. Minor surface tension cracks are visible in places on the surface. Topography has lowered between three and twelve feet across the existing subsided areas. Mine life is currently projected to last 4 years (or until 2012) based on existing leased reserves.

#### **Coal Exploration Drilling & Methane Drainage Drilling**

Several drill holes dating from the 1990s are within project area. Some access roads are still visible. Reclamation success has returned lands to prescribed uses. Road closures and/or obliteration are inhibiting traffic. Current disturbance associated with BRL's operations in the project area includes four MDW pads (approximately 4 acres total), 1.6 miles of access road, and less than 1 mile of temporary road. BRL has reclaimed four MDW pads (approximately 4 acres) and 0.7 miles of road. BRL maintains approximately 118 surface water monitoring stations (ponds, springs, streams, ditches, etc) in the vicinity of the project area (Annual Hydrology report 2007). Routine monitoring occurs generally three times per year (quarterly without winter monitoring). BRL also monitors a network of approximately 50 ground water monitoring wells/drill holes/formation throughout their permit and lease areas.

BRL is anticipated to be approved for 13 additional gob vent boreholes in 2008 from 9 locations over existing leases.

Subsidence monitoring has occurred since 1997 in support of previous BRL lease applications.

#### **Range Use/ Improvements**

NFS and BLM lands have been grazed for many years and are currently

managed on an intensive time-controlled system. No changes in the grazing system are planned. Existing range features and improvements include stock trails, stock tanks, and fences.

#### **Recreation**

The project area has no developed recreation sites. Dispersed recreation includes camping, use of all-terrain vehicles (ATVs) on "Jeep Trail" and Terror Creek access. Primary use occurs during hunting seasons. No recreation developments are planned.

#### **Special Use Authorization**

Terror Creek Ditch which conveys water from Terror Creek Reservoir (maintained annually) and an outfitter-guide are the only activities under permit in the area.

Additionally, a Memorandum of Understanding exists for the operation and maintenance of the Curecanti-Rifle 2301345 kV electric transmission line.

#### **Road and Trail System**

NFSR 842 is the primary access used by forest visitors, range and special use permittees, and BRL. The road is low standard and maintained for travel in high clearance vehicles. BRL has performed maintenance in the past 10 years on portions of the road. Other temporary roads have been constructed and reclaimed in the past 15 years for coal exploration or other drilling purposes. Due to steep terrain, user-created off-highway vehicle (OHV) trails are minimal in the area.

#### **Reasonably Foreseeable Future Development on Lease Modification**

The environmental analysis will incorporate a reasonably foreseeable development plan (RFDP) in order to address cumulative impacts. This RFDP



will include surface impacts such as methane drainage needs (pad and roads). The RFDP will be developed by the proponent with cooperation from the USFS. The future actions described herein are based upon existing information and are logical approximations of what is expected to occur in this area to provide for safe operation of the underground mine. Values in this analysis are estimates. Currently, reasonably foreseeable development for this lease modification area includes three (3) methane drainage wells and approximately three (3) miles of associated access roads.

One of these wells will likely be on a pad from a previous exploration, and will need reopening of a rehabilitated (2007) road and pad, but no new disturbance. The rehabilitated area was recontoured and seeded in 2007 and has had minimal vegetation growth to date. A second well will likely be on the coal exploration well pad described below. The third will likely be built at the end of a road off of the first pad. Topography limits the location of roads and pads in this lease modification area. Water depletions from the drilling of methane drainage wells in the future is included in the endangered fish analysis in this document.

### **3.2 Air Quality Affected Environment**

Air quality in the study area is affected by activities currently conducted within the area. The study area for direct, indirect, and cumulative effects is defined here as the County of Gunnison (approximately a 40-mile radius around the City of Gunnison-general area of nearest Class II sensitive viewshed). Activities occurring within the study area that affect air quality include fixed

facilities such as coal mining and subsequent coal mining operations (e.g., loading), concrete mix plants, gravel pits, lime storage facilities, natural-gas fired electrical generating plants, natural gas dehydration facilities, landfills, and crematoriums, etc. Portable source examples include facilities such as gravel crushers, associated processing equipment, and asphalt plants. Smoke from grass and forest fires from late spring through early fall can affect air quality depending on the year. Potential impacts to air quality from installation of the methane drainage wells and the ventilation/escapeway shaft were evaluated using the type and source of priority pollutants (e.g., equipment engines emissions and dust from construction activities) and air regulations (including emission standards, as applicable) pertinent to the project. It is estimated for this analysis that 1 to 2 MDWs would be in operation at any given time and life of an MDW varies from one to three months depending on placement in the panel. Baseline information for air resources in the study area was derived from other coal NEPA projects in the area. Baseline information includes data such as area impacted by construction activities (e.g., drill pad areas, length of roads, etc.) equipment type, and duration of construction and the project. Approximately 7.4% of US emissions of methane come from coal mining and approximately 75% (or 5.6% of US methane emissions) of that comes from underground coal mining activities. Comparative information, such as ambient air quality, atmospheric conditions, and existing air emission sources, were derived from databases maintained by the United States Environmental Protection Agency (U.S. EPA 2006a) and Colorado Department of Public Health and Environment, Air

Pollution Control Commission (CAPCC 2006a). Regulatory standards for air quality (e.g., criteria pollutants) were obtained from U.S. EPA (U.S.EPA 2006b) and Colorado Department of Public Health and the Environment Air Pollution Control Commission (CAPCC 2006b).

#### **Area Air Quality**

The federal government and CAPCC have established ambient air quality standards for criteria air pollutants. The criteria pollutants are carbon monoxide (CO), lead (Pb), sulfur dioxide (SO<sub>2</sub>), particulate matter smaller than 10 microns (PM<sub>10</sub>), ozone (O<sub>3</sub>), and nitrogen dioxide (NO<sub>2</sub>). In 1997, the U.S. EPA revised the federal primary and secondary particulate matter standards by establishing annual and 24-hour standards for particulate 2.5 micrometers in diameter or smaller (PM<sub>2.5</sub>). Ambient air quality standards must not be exceeded in areas where the general public has access. Table 3.2 lists federal and state air quality standards. National primary standards are levels of air quality necessary, with an adequate margin of safety, to protect public health. National secondary standards are levels of air quality necessary to protect public welfare from known or anticipated adverse effects of a regulated air pollutant. The attainment status for pollutants in the project area is determined by monitoring levels of criteria pollutants (CO, Pb, SO<sub>2</sub>, PM<sub>10</sub>, O<sub>3</sub>, and NO<sub>2</sub>) for which National Ambient Air Quality Standards (NAAQS) and Colorado quality in the study area is designated as attainment for all criteria pollutants. The attainment designation means that no violations of Colorado or national air quality standards have been documented in the area.

No data is available regarding current ambient methane concentrations in air, because methane is not yet a regulated constituent.

Quarterly reporting of methane emissions to BLM is considered confidential information and cannot be released by the Forest Service. However, the values used to estimate methane emissions included in the analysis were based on values associated with 2007 averages.

#### **PSD Classification**

The area surrounding the study area is designated a Class II area, as defined by the Federal Prevention of Significant Deterioration (PSD) provision of the Clean Air Act. The PSD Class II designation allows for moderate growth or degradation of air quality within certain limits above baseline air quality. Industrial emission sources proposing construction or modifications must demonstrate that the proposed emissions will not cause significant deterioration of air quality in all areas. The standards for significant deterioration are more stringent for Class I areas than for Class II. Federal/State Mandatory Class I Areas located in the project area include West Elk Wilderness at approximately 10 miles south-southeast and Black Canyon of the Gunnison National Park approximately 25 miles southwest of Somerset, Colorado. Due to the nature of the project (i.e., mobile equipment), no specific permit requirements apply to gaseous emissions. However, construction will be required to comply with fugitive dust provisions under Regulation 1 (5CCR 1001-3) which requires that precautions be taken to control fugitive emissions (e.g., airborne particulate matter) to levels below percent opacity. The Bowie Mine No. 2 currently operates under air emission

discharge permits obtained from the State of Colorado. Activities under the proposed action are not anticipated to require a modification of existing or

application for new permits (USDA FS 2006a).

**Table 3.2. State of Colorado and National Ambient Air Quality Standards**

| Pollutant                               | Averaging Time            | Air Quality Standard Concentration <sup>(a)</sup> |  |
|---|---------------------------|---|--|
|   |                           | Colorado  | National   |
| Ozone                                   | 1 hour                    | 235 µg/m <sup>3</sup> (0.12 ppm)                  | 235 µg/m <sup>3</sup> (0.12 ppm)                 |
|   | 8 hours                   | --  | 157 µg/m <sup>3</sup> (0.08 ppm)                 |
| Carbon Monoxide                         | 1 hour                    | 40,000 µg/m <sup>3</sup> (35 ppm)                 | 40,000 µg/m <sup>3</sup> (35 ppm)                |
|   | 8 hour                    | 10,000 µg/m <sup>3</sup> (9 ppm)                  | 10,000 µg/m <sup>3</sup> (9 ppm)                 |
| Nitrogen Oxides                         | Annual Arithmetic Mean    | 100 µg/m <sup>3</sup> (0.05 ppm)                  | 100 µg/m <sup>3</sup> (0.053 ppm)                |
| Sulfur Dioxide                          | Annual Arithmetic Mean    | 10 µg/m <sup>3</sup> (0.004 ppm) <sup>(c)</sup>   | 79 µg/m <sup>3</sup> (0.03 ppm)                  |
|   | 24 hours                  | 50 µg/m <sup>3</sup> (0.02 ppm) <sup>(c)</sup>    | 367 µg/m <sup>3</sup> (0.14 ppm)                 |
|   | 3 hours                   | --  | 1,310 µg/m <sup>3</sup> (0.5 ppm) <sup>(b)</sup> |
| Particulate Matter as PM <sub>10</sub>  | Annual Arithmetic Mean    | 50 µg/m <sup>3</sup>                              | 50 µg/m <sup>3</sup>                             |
|   | 24 hours                  | 150 µg/m <sup>3</sup>                             | 150 µg/m <sup>3</sup>                            |
| Particulate Matter as PM <sub>2.5</sub> | Annual Arithmetic Mean    | --  | 15 µg/m <sup>3</sup>                             |
|   | 24 hours                  | --  | 65 µg/m <sup>3</sup>                             |
| Lead (Pb)                               | Quarterly Arithmetic Mean | --  | 1.5 µg/m <sup>3</sup>                            |

Note: µg/m<sup>3</sup> = micrograms per cubic meter; ppm = parts per million; PM<sub>10</sub> = Particulate Matter smaller than 10 microns; PM<sub>2.5</sub> = Particulate Matter smaller than 2.5 microns.

Sources: Colorado Code of Regulations (CCR) 5 CCR 1001-14 and Code of Federal Regulations, 40 CFR Part 50, National Primary and Secondary Ambient Air Quality Standards

(a) Primary Standard unless otherwise noted

(b) Secondary Standard

(c) Category II increment per 5-CCR-1001-14

### 3.3 Air Quality Environmental Consequences

#### 3.3.1 No Action

Under the No Action Alternative, gaseous and fugitive (e.g., particulate matter) emissions in the area would remain at current levels because methane drainage is occurring in the project area due to previously approved projects.

An estimated 160 tonnes of methane (based on 2007 values submitted to

BLM by BRL) would be released to the atmosphere each year as the result of MDW venting and continued mining at Bowie No. 2 mine. No fan discharge of methane was reported.

Coal fired power plants will continue to release CO<sub>2</sub>, NO<sub>x</sub> and SO<sub>2</sub> which are believed to cause global warming or are criteria pollutants at the current rates.

#### 3.3.2 Proposed Action

##### Particulate Emissions

Potential sources of particulate such as smoke, soot, dust, and vehicle and industrial emissions (PM<sub>10</sub>, PM<sub>2.5</sub>

pollutants) would come from equipment used during reasonably foreseeable development such as the construction and operations and maintenance of the access roads, methane drainage wells. These emissions would include fugitive dust from vehicles traveling on dirt roads and engine emissions. As no surface activities are proposed at this time no estimates on hours of operation of vehicles or pounds of dust per year are able to be calculated, however they are anticipated to be minimal, if not immeasurable, due to the limited amount of reasonably foreseeable development. Dust abatement could further reduce particulates. Fugitive dust emissions would further decrease once construction of reasonably foreseeable development was complete.

### **Proposed Alternative Gaseous Emissions**

Potential sources of gaseous emissions (NO<sub>2</sub>, SO<sub>2</sub>, and CO) would come from equipment used during the construction of the reasonably foreseeable access roads and methane drainage wells. Emissions would be from engines and would decrease in quantity when reasonably foreseeable construction is complete.

Information on other potential gaseous emission including: ethane, propane, pentane, hexane, alkenes, aldehydes, and benzene/benzene derivatives is not available for the Bowie No. 2 Mine. However, when the information becomes available, effects would be analyzed under an air permit modification if the levels generated make a modification necessary.

Operations and maintenance of potential methane drainage wells, and roads would contribute gaseous emission of NO<sub>2</sub>, SO<sub>2</sub>, and CO although at about half

the pounds per year as construction activities.

It is impossible to quantify emissions related to coal that is burned at coal fired power plants with regard to the coal in the lease modification as it will be mixed with other less compliant coals all over the United States to meet air quality standards. Coal fired power plants will continue to release CO<sub>2</sub>, NO<sub>x</sub> and SO<sub>2</sub> at the current rates.

### **Greenhouse Gases**

Gaseous emissions in the form of methane from methane drainage wells and other ventilation activities would occur during the project from all systems including: vertical wells/gob vent boreholes (MDWs) and main mine fans. Methane is over 20 times more effective in trapping heat in the atmosphere than CO<sub>2</sub> over a 100-year period. Methane emissions, from an air permit perspective, are not regulated by the State of Colorado. Preliminary modeling results using EPA's SCREEN3 air model indicate that methane concentrations from the reasonably foreseeable methane drainage wells may result in an increase of breathing zone methane concentrations in air which would still be below the Mine Safety and Health Administration (MSHA) level of one percent.

An estimated 160 tonnes of methane (based on 2007 values submitted to BLM by BRL) of unknown concentration would continue to be released to the atmosphere each year as the result of MDW venting and continued mining at Bowie No. 2 mine. No fan discharge of methane was recorded, so no assumptions can be made as to the release of methane from that location. Assuming that mining is continued for two additional weeks

based on the slight increase in coal quantity in the lease modification compared to that which has been previously approved and found unmineable, it is possible, although not predictable, that up to 5 additional tonnes of methane may be released from anywhere in the mine.

### **Class I Airshed**

The Class I airshed (West Elk Wilderness) is 10 miles from the project area and there would be no effects on the Class 1 airshed from proposed activities.

The proposed Action would contribute immeasurable greenhouse gases, along with those produced from the other North Fork coal mines, and emission from every other man-made and natural source of greenhouse gas. However, because there is minimal increase in coal production (approximately 14 trainloads) proposed due to the relocation of reserves that are currently under permit and hence no increased transportation needs (no new infrastructure or frequency of trains), there would be no measurable impacts on air quality over current conditions.

### **3.3.3 Cumulative Effects**

An average of >15 million cubic meters per year (5.5 billion cubic feet per year) or 2,215,749 tonnes CO<sub>2</sub> equivalent/year has been released from previous coal mining activities in the North Fork Valley in the last 5 years. Continuation of mining at Bowie No. 2 Mine will release approximately 3,689 tonnes of CO<sub>2</sub> equivalent/year.

Short-term impacts from the proposed action would contribute cumulative effect in the form of short-term particulate and gaseous emissions resulting from construction activities.

Ongoing, existing activities discussed in the Affected Environment will continue to affect air quality, and emissions and particulate contributed by the proposed action would likely not be noticeable or measurable within the study area and would not exceed any established air quality standards. All alternatives would contribute additional greenhouse gases, along with those produced from the other North Fork coal mines, and emissions from every other man-made and natural source of greenhouse gas.

### **3.3.4 Possible Mitigation for All Alternatives**

Direct mitigation of the release of methane through either flaring or capturing methane and putting to beneficial use would be very effective in reducing greenhouse gas emissions.

Flaring of methane gas was brought forward as a way to mitigate venting of methane, a potent green house gas, to the atmosphere. It is acknowledged that flaring may be used to reduce green house gas emissions in an approved system. Flaring is driven by economic concerns such as carbon credits available if capture and use is not readily available because of the distance to a pipeline. Systems that use methane flaring (including abandoned mines, gas production wells and landfills) around the world still capture the gas and flare from a controlled system. When methane is burned or flared the resulting compounds are water and CO<sub>2</sub>. It is estimated that the CO<sub>2</sub> equivalent of methane may be reduced by as much as 87% through flaring assuming a concentration of 90% methane (based on a report by Shell Coal in Australia (<http://www.greenhouse.gov.au/challenge/members/shell.html>)). If flaring is approved for project area, flaring may

**Comment [F1]:** Let's verify with Desty on the amount of time this mod represents...just to be sure...you think?

result in final CO<sub>2</sub> equivalent emissions of approximately 480 tonnes depending on the efficiency of the flaring system approved. There are additional factors which may come into play, while flaring pure, or nearly pure, concentrations of methane results in a large greenhouse gas emission reduction, other inert constituents in the gas flared can become criteria pollutants. For this project, inert constituents are estimated to be between 6 and 77% (based on methane concentrations in other areas of the North Fork) which when flared with the methane result in nitrogen oxides and carbon monoxide which are criteria pollutants. It is unknown due to the fluctuating nature of the gas constituents what effects this might have on Colorado and National Ambient Air Quality Standards and Permitting and would also require site-specific emissions monitoring if flaring is ever approved to determine air permit requirements. Flaring in an active mine in the US has not yet been approved by MSHA.

Capture of methane gas was also brought forward as a way to mitigate venting of methane. This method would likely require additional infrastructure and further studies to evaluate the economic feasibility from this mine. The relatively low levels of methane released by this mine may make this cost prohibitive.

The likelihood of flaring or methane capture occurring is low as the coal lessee and the gas lessee are different companies without a partnership for operations.

Offset mitigation of the release of methane is possible and may or may not be reasonable due to the small quantities of methane released.

Further, since methane is not regulated, nor have any standards been promulgated by EPA, the federal agencies (BLM, FS, OSM, MSHA, MMS and EPA) and state agencies with delegated authority (DRMS and CDPHE) operating within their jurisdiction in the federal coal program cannot currently require or request flaring or capture as a mitigation measure. This situation is currently under review by many State and Federal Agencies.

### **3.3.5 Consistency with Forest Plan and Other Laws**

Proposed Action would be consistent with air quality and fugitive dust provisions required by the Colorado and National Ambient Air Quality Standards and PSD increments as well as alternative gaseous emissions regulated by the Mine Safety and Health Administration. The proposed action is also consistent with Forest Service Manual 2580-Air Resource Management and the 1991 GMUG Forest Plan.

## **3.4 Topographic and Physiographic Affected Environment**

The analysis area encompasses the lands within and immediately surrounding the lease modification area. Topography of the general area ranges from steep to relatively flat.

The elevations in the lease modification area range from about 6,500 feet in the Hubbard Creek drainage to 8,300 feet just east of Terror Creek Reservoir. The lease modification area is drained by Iron Point Gulch (ephemeral), which drains into Hubbard Creek. These drainages empty into the North Fork of the Gunnison River. The topography of

the area has been greatly influenced by a wide range of mass movement landforms and historic geologic processes (e.g., faulting). The Hubbard Creek drainage contains localized landslides and rock falls (both natural and mining induced). Landsliding in this region is usually preceded, accompanied, and followed by perceptible creep along the surface of the slide or within the slide mass.

Landslides, rock falls, and other areas of general geologic/topographic instability are shown on Figure 3.4 Geologic Hazards Map.

### **3.5 Topographic and Physiographic Environmental Consequences**

#### **3.5.1 No Action**

If the No-Action Alternative is selected, coal would not be mined in the lease tracts. The coal resource and the topography of the Iron Point Coal Lease modification area would remain unchanged. Natural processes would continue.

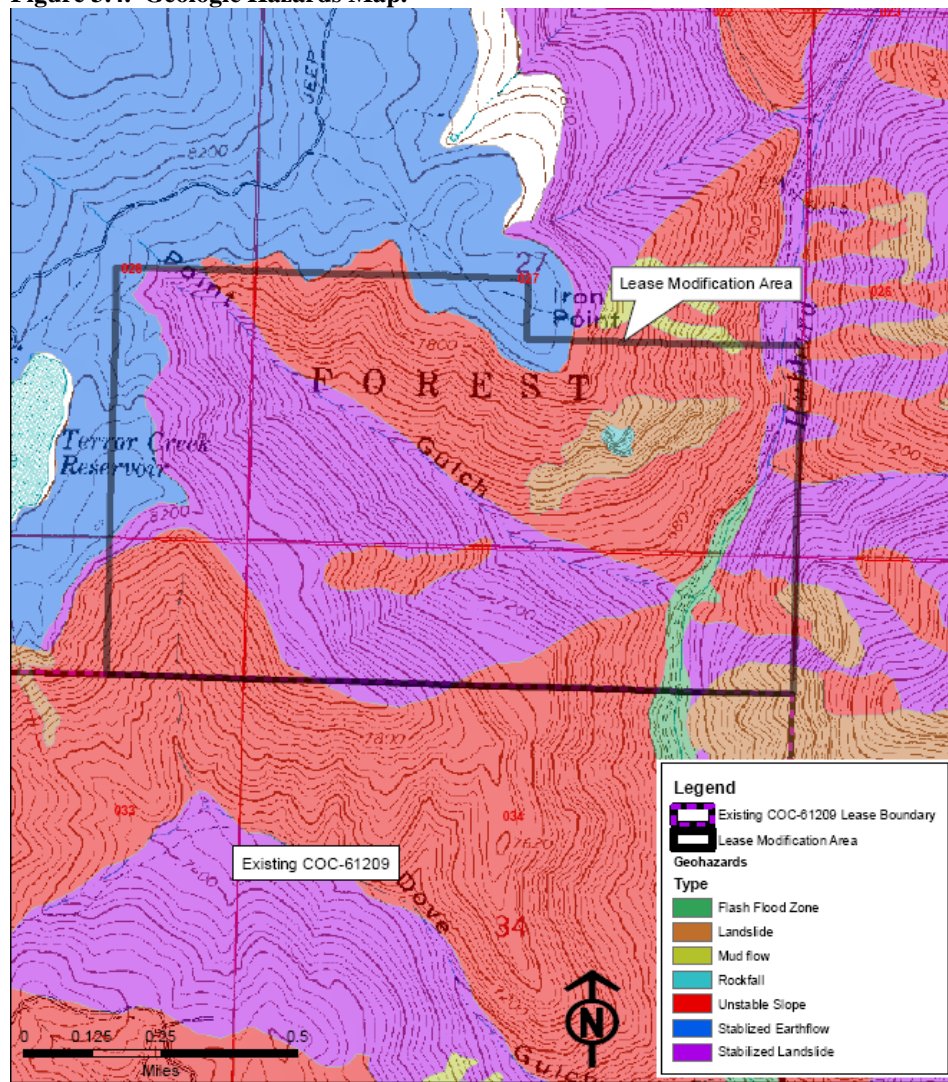
#### **3.5.2 Proposed Action**

The actual leasing of the lease modification would impose no topographic change on the tracts. If the

tract is leased, subsequent underground longwall mining would cause subsidence as discussed in Makeki Technologies, Inc, 2007, *Prediction of Surface Deformation Resulting from Longwall Mining in the Dove Gulch Area for the New Layout*. Subsidence does occur in areas above and adjacent to longwall mining. The amount of subsidence triggered by longwall mining depends on many factors including mine plans, coal thickness, geologic strata, and overburden depth. As a general rule, the greater the overburden thickness, the less the surface subsidence there will be.

Subsidence would be most noticeable on ridges and steeper slopes, particularly cliffs, where cracks might appear on the order of a few inches to possibly 2-feet wide, and up to 50 feet deep. Fewer cracks would appear in the valleys than on ridges because the alluvial material found in the valleys is more yielding than the brittle bedrock found on the ridges, thereby “healing” the crack. Previous mining (subsidence) in the general vicinity has created landslides and rockfalls on the edges of ridges and cliffs. Some of these geologic instabilities are small scale features, affecting less than 100 cubic yards, but others can be large scale, affecting thousands of cubic yards of material.

Figure 3.4. Geologic Hazards Map.



Other natural factors may cause an acceleration of impacts, which may mimic mine-induced instability. For example, during an extremely wet spring, the moisture from snowmelt and spring rains could cause natural landslides and rock falls to move and shift. This seems to have been the case in 1984. During a period of intense

precipitation and moisture, Hubbard Canyon experienced a large amount of mass movement, which, in turn, buried the Hubbard Canyon Road. It is still closed today. Therefore, it is sometimes difficult to assess whether a mass movement is occurring due to subsidence or other naturally occurring processes.



As mentioned earlier, the thickness of coal mined influences the total amount of subsidence. For example, assuming a coal extraction thickness of 12 feet for the D seam in the nearby Elk Creek Coal Lease Tract, surface subsidence would be expected to be 7 to 8 feet for those areas with 500 feet of overburden. At overburden depths of 2,000 to 2,500 feet, surface subsidence would be projected between 1 and 3 feet. The subsidence over the gate roads (entries on either side of a longwall panel) is typically 1 to 2 feet less than the panel itself. Figure 3.5 Anticipated Subsidence, shows the expected location and magnitude of subsidence in the lease modification area<sup>1</sup>. Within the modification area, the maximum amount of subsidence anticipated is 9 feet (Maleki 2007).

Topographic changes caused by subsidence with longwall mining are often unnoticeable to the untrained eye. Subsidence at any given point on the surface begins when the longwall face is beneath that point and is generally 90 percent complete when the longwall face has passed at 1.2 to 1.4 times the overburden depth beyond the point of mining. For example, at 500 foot depth of over-burden, the subsidence beneath longwall mining would be 90 percent complete within about a month when the longwall face is 600 to 700 feet beyond that point on the surface.

Other than lowering the land surface, the long-term effects of subsidence on surface topography would be minimal, and even unnoticeable to most casual

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<sup>1</sup> This assumes the lease modification area will be mined in a manner consistent with Bowie's Permit Revision 11, currently under review by the CDRMS.

observers. Some residual cracks may remain in the more brittle bedrock material on ridges or cliffs. Overall, the topography above subsided longwall mining workings would be similar to the pre-mining topography, albeit lower in elevation. Subsidence from underground mining could initiate, aggravate, and perhaps even accelerate, the existing landslides and rock falls in the area.

There are no anticipated indirect long-term topographic impacts expected for surface facility disturbances supporting underground mining activities. These areas would be re-graded and re-contoured following mining closure and removal of structures in such a manner that the area would blend into the surrounding undisturbed terrain.

Hubbard Creek is within a 'limited extraction zone', where direct subsidence is not permitted. This is stipulated on the parent lease COC-61209, and will be carried forward in the lease modification. Within the modification area, the subsided land is projected to come within 327' of Hubbard Creek, although actual mining in outside the 1/8 mile buffer of Hubbard Creek. This subsidence may increase sedimentation into the creek. However, due to a high natural sediment load it would be difficult to differentiate between natural and mine-induced sedimentation.

### 3.5.3 Cumulative Impacts

As discussed in Section Geologic Hazards, the North Fork Valley region east of the town of Paonia has numerous existing natural landslide and other unstable areas. These natural features when combined with subsidence from existing and future coal mining would continue to contribute to future changes

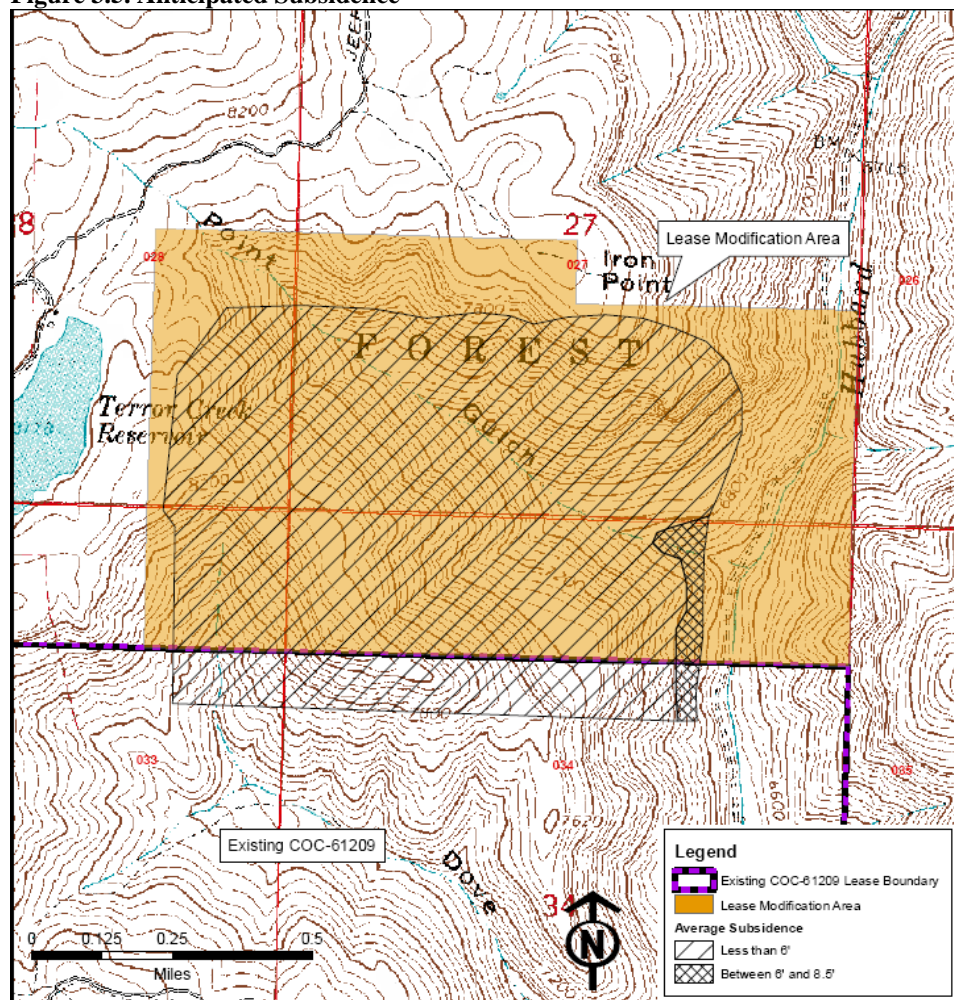
in the topography of the area. In addition, if landslides and rockfalls are initiated or accelerated due to subsidence, increased sedimentation and erosion is likely to occur in those areas.

### 3.5.4 Conditions of Approval

Currently, subsidence monitoring is a requirement of the mine permit issued by the Colorado DRMS. If surface cracks

occur that affect other uses (roads, trails, etc.), the surface management agencies have authority to require timely on-site mitigation. In addition, under current lease terms no subsidence is allowed under Hubbard Creek. Therefore, no additional conditions of approval are recommended beyond those in the parent lease.

**Figure 3.5. Anticipated Subsidence**



### 3.5.4 Consistency with Forest Plan and Other Laws

The Proposed Action is consistent with Forest Plan standards for geology which establishes limits on ground-disturbing activity on unstable slopes and highly erodible sites, and regulations adopted pursuant to the Surface Mining Control and Reclamation Act of 1977 and the State of Colorado's OSM-approved permanent program for coal mining per the Colorado Surface Coal Mining Reclamation Act as administered by the CDRMS with oversight from the OSM, which govern all direct effects of coal mining, including those that may impact geology. Other impacts to the geologic resource that may occur as a result of mining, including landslides and erosion, must be mitigated to stabilize the surface and return the land to an approved post-mining land use.

## 3.6 Geology Affected Environment

The characteristics of a coal deposit dictate the most economical and practical mining application. See Appendix C. Geologic data and the interpretations form the basis for mine evaluation and mine production by providing coal reserve estimates and geologic structure data (such as dip, faults, fracture patterns, etc.). For underground mining operations, geologic information is also used to assess subsidence.

### General Geology

The Iron Point coal lease modification lies in the Paonia-Somerset coal field which contains medium to high coal development potential deposits. The main coal beds within this area are found in the Upper Cretaceous Mesa Verde Formation. In addition to the

sedimentary units in the region, isolated igneous intrusions have been encountered. Iron Point, located in Section 27, T12S, R91 W, is an example of an igneous intrusion. Geologic data indicates that other similar intrusions have compromised the coal in the vicinity of the Iron Point Coal Lease.

The coal bearing sedimentary strata of the Mesa Verde Formation are relatively flat lying with a regional dip of approximately five degrees to the north/northeast. Local dips can vary. The principal mineable coal seams on the Iron Point Coal Lease are the "D" seam and the "B" seam. Other seams within the tract, A, C, and E, are either considered too thin (less than 6 feet) or are too discontinuous to mine.

The Tertiary Wasatch Formation, Upper Cretaceous Mesa Verde Formation, and Quaternary deposits outcrop within the Iron Point lease and modification area. The Cretaceous Mancos Shale does not outcrop on the lease tracts but lies below the Mesa Verde Formation. The following is a brief overview of the geologic units in the area:

- *Quaternary Deposits:* The Quaternary deposits are an unsorted mixture of soil and rock formed by various mass-wasting processes such as landslides, earth flows, soil creep, and debris avalanches. These deposits also include slope colluvium and Quaternary unconsolidated deposits derived from the Wasatch Formation.
- *Wasatch Formation (Tertiary):* The Wasatch formation overlies the Mesa Verde Formation. It consists of red and buff shales and red sandstones in the upper part of the formation, and red to gray conglomerates in the lower

portion. The Ohio Creek conglomerate, which is the basal conglomerate unit, is a regional marker and commonly referenced geologic mapping datum.

- *Mesa Verde Formation* (Cretaceous): The Mesa Verde Formation is the primary coal bearing formation in this region and conformably overlies the Mancos Shale Formation. It consists of approximately 2,300 feet of interbedded coal seams, sandstones, shales, and siltstones. The Mesa Verde Formation consists of the Barren Member, Paonia Member, Bowie Member, and Rollins Sandstone Member. The Barren Member is approximately 1,600 feet in thickness and contains no coal seams. The Paonia Member ranges from approximately 300 to 500 feet and is composed of shales and interbedded sandstone. The Paonia Member contains the D and E coal seams. The Bowie Member ranges from 270 to 350 feet thick and consists primarily of grey shales, interbedded lenticular sandstones, and coal seams. The Bowie Member contains the A, B, and C coal seams. The Rollins Sandstone ranges from 120 to 200 feet in thickness. It is a massive, cross-bedded medium to coarse grained, buff to white sandstone unit. The Rollins Sandstone lies conformably on the underlying Mancos Shale and is relatively continuous throughout the area, thus serving as a common marker bed.
- *Mancos Shale (Cretaceous)*: The Mancos Shale is a regionally

extensive bed of marine shales ranging up to 4,000 feet in thickness. In the lease tracts, it underlies the exposed geologic sequence. West of the town of Somerset, the North Fork of the Gunnison River has cut through the upper portion of the Mancos Shale, exposing the grey marine shales which are prominent with this formation.

Geologic faults in the area have been observed to have steep dips (ranging from about 75 degrees to vertical) and throws varying from 0-10 feet.

#### **Geologic Hazards**

Land within and surrounding the modification area has numerous existing natural landslide areas and other unstable slopes. Landslides, rock falls, and other areas of general geologic/topographic instability are shown on Figure 3.4 Geologic Hazards Map.

Geologic hazards have been mapped in accordance C.R.S. 1973, 24-65.1-101, et. seq. Geologic hazards, which are a normal dynamic process, can be intensified or lessened by human activity. Most of the geologic hazards observed in area are historic in nature. However, during periods of high precipitation in the mid 1980s, there was increased movement of existing landslides and development of new landslides on unstable slopes.

Previous mining in the general vicinity has initiated landslides and rockfalls on the edges of ridges and cliffs. Some of these geologic instabilities are small scale features, affecting less than 100 cubic yards, but others can be large scale, affecting 1000s of cubic yards of material.

#### **Other Geologic Resources**

The lands in the area have been rated as having high potential for oil and gas (Colorado Oil & Gas Potential Map, BLM, 1991). The project area is near the edge of the productive basin and exploration interest has been increasing. The area under the existing Iron Point Lease, as well as, the modification area, has been lease for gas resources, although no development has occurred. Wells have been drilled to the Dakota Sandstone a few miles to the southwest and to the northwest of the lease tract areas.

Methane is found in the coal seams and surrounding sandstones and is released through the mining process. Interest in coal bed methane capture is high in the immediate area. See Air Quality Section for further discussion.

Other coal seams in the project area are not considered economically recoverable

### **3.7 Geology Environmental Consequences**

If leasing and mining proceeds on the Iron Point Coal Lease modification area, coal would be removed and the overlying overburden material would be altered through subsidence. The coal would be extracted, and the existing geologic structure and lithologic continuity in the area above the mined coal would be altered by subsidence.

Any oil and gas resources in the coal seams would be lost. Recoverability of any oil and gas resources present in geologic formations above and below the coal seams could be reduced.

#### **3.7.1 No-Action**

If the No-Action Alternative is selected, coal would not be mined in the lease tracts. The coal resource and the

structural and lithologic integrity of the Iron Point Coal Lease modification area would remain in-place. The potential to recover the coal resource at some time in the future would remain. Geologic instabilities, such as landslides and rockfalls would continue in historic magnitudes.

#### **3.7.2 Proposed Action**

Under the Proposed Action, coal would be mined by longwall techniques. After coal recovery, the overburden would be altered due to subsidence. Subsidence would occur due to the extraction of coal. However, due to the thickness of the overburden in the lease tract, it is anticipated that subsidence would not be easily seen by casual observers.

As it has been demonstrated in areas south of the lease modification area, there is a potential that mining subsidence could aggravate existing landslides and other geologic hazards (eg. rock falls) in the Hubbard Creek drainage. As subsidence causes tension zones near the edges of ridges and/or cliffs, this force can induce shearing and movement within the rock formations, thereby initiating mass movement.

Other natural factors may cause an acceleration of impacts, which may mimic mine-induced instability. For example, in an extremely wet spring, the moisture from snowmelt and spring rains could cause natural landslides and rock falls to move and shift. This seems to have been the case in 1984, during a period of intense precipitation and moisture Hubbard Canyon experienced a large amount of landslides. This mass movement closed Hubbard Canyon Road, which is still closed today.

That said, it is sometimes difficult to assess whether a mass movement is

occurring due to subsidence, or other naturally occurring processes.

Residual subsidence from historic room-and-pillar mining has and will continue to create mining induced seismic events in the area. For example, seismic events from the now abandoned Somerset Mine have been measured on the Richter Scale at the U.S. Geological Survey (USGS) Earthquake Center in Golden, Colorado.

Mining induced seismic events as a result of longwall mining may occur. Based on existing information, these events are not expected to cause damage to surface resources or overlying structures. Bowie is currently participating with the National Institute of Occupational Safety and Health (NIOSH), and Mountain Coal Company, by being part of the North Fork Valley Seismic Network. Bowie manages 5 seismic stations as part of this network, and reports are generated quarterly (see project file for further information).

Mining of the coal seam(s) could result methane loss within the coal bed. Recoverability of any oil and gas resource present in geologic formations above and/or below the coal seams could be reduced due to the evacuation of gas through mine ventilation, see the Air Quality section for details. However, due to the fracturing of the rock from mining, the potential exists for the recoverable gas resource to be increased, due to changes in porosity and permeability.

There are a number of landslides and other unstable slopes in the region. Subsidence beneath such steep slopes could contribute or aggravate landslide movements, but this determination is difficult to quantify given the natural (pre-mining) geologic instability of the local area.. Special subsidence protection (i.e., barrier pillars, buffer zones, etc.) is

already required in the existing lease terms for Hubbard Creek.

### **3.7.3 Cumulative Impacts**

Historically, a considerable amount of the area surrounding the lease modification area has been mined. Both natural and mine induced mass movements are likely to continue in the vicinity of the lease modification area. In addition, if landslides and rockfall are initiated or accelerated due to mine operations, increased sedimentation and erosion is likely to occur in those areas. Due to the naturally occurring mass movements, and natural sedimentation loads and erosion rates, it would be difficult to quantify natural vs. mine induced changes. Gas production, in a conventional sense, will probably be delayed until coal mining is completed in this area.

### **3.7.4 Conditions of Approval**

Currently, subsidence monitoring is a requirement of the mine permit issued by the Colorado DRMS. If surface cracks or mass movements occur that affect other uses (roads, trails, etc.), the surface management agencies have authority to require timely on-site mitigation. In addition, under current lease terms no subsidence is allowed under Hubbard Creek. The Colorado DMG requires detailed information, monitoring, and repair of subsidence impacts as set forth in Section 2.05.6(6), Subsidence Survey, Subsidence Monitoring, and Subsidence Control Plan, of the Regulations of the Colorado Mined Land Reclamation Board for Coal Mining. These regulations have been in force for Colorado since 1980. Therefore, no additional conditions of approval are recommended beyond those in the parent lease for this resource area.

### **3.7.5 Consistency with Forest Plan and Other Laws**

The Proposed Action is consistent with Forest Plan standards for geology which establishes limits on ground-disturbing activity on unstable slopes and highly erodible sites, and regulations adopted pursuant to the Surface Mining Control and Reclamation Act of 1977 and the State of Colorado's OSM-approved permanent program for coal mining per the Colorado Surface Coal Mining Reclamation Act as administered by the CDRMS with oversight from the OSM, which govern all direct effects of coal mining, including those that may impact geology. Other impacts to the geologic resource that may occur as a result of mining, including landslides and erosion, must be mitigated to stabilize the surface and return the land to an approved post-mining land use.

### **3.8 Soils Affected Environment**

Authorities specifically governing Forest Service soil management include the Multiple-Use Sustained Yield Act of 1960 and the Forest and Rangelands Renewable Resources Planning Act of 1974, as amended by the National Forest Management Act of 1976 (NFMA). The GMUG Forest Plan authorizes and governs management of mineral resources and surface uses over them. With respect to soils management, the GMUG Forest Plan establishes limits on ground-disturbing activity on unstable slopes and highly erodible sites. The Forest Plan further directs using site preparation methods to keep fertile topsoil intact, revegetating areas disturbed during road construction, and design mitigations and restoration to ensure that 80 percent original ground

cover occurs within 5 years after disturbance.

Regulations adopted pursuant to the Surface Mining Control and Reclamation Act of 1977 and the State of Colorado's OSM-approved permanent program for coal mining per the Colorado Surface Coal Mining Reclamation Act as administered by the CDMG with oversight from the OSM, govern all direct effects of coal mining, including those that may impact soils. These acts and attendant regulations require that topsoil be removed, stockpiled, and replaced on reclaimed surfaces associated with construction or mining disturbance. Other impacts to the soil resource that may occur as a result of mining, including landslides and erosion, must be mitigated to stabilize the surface and return the land to an approved post-mining land use.

Soils information and technical data were taken from the following soil survey completed for the project area:

- An Order III soil survey, entitled Soil Survey of Grand Mesa-West Elk Area (Cryer and Hughes, 1997) was used to characterize and describe the soils overlying that portion of the project area administered by the Forest Service.

These surveys each contain soil maps depicting the aerial extent of the soils delineated as well as map unit descriptions, typical pedon descriptions, and interpretation tables which were used to develop the text below. These two soil surveys were not correlated, and the map unit boundaries merging along federal and private land boundaries do not necessarily meet.

No site-specific soil baseline studies were conducted for the modification area as a part of this project.

Soils in the project area have developed from a combination of residual, colluvial, and alluvial materials derived from local bedrock. The soil survey identified and described six map units within the tract. The map unit name, percentage coverage within the modification area, dominant soil series and attendant percent map unit composition, relative depth, hazard classifications (water erosion, shrink swell, and mass movement), and considerations as described in the soil survey are shown in Table 3.8.

Soils in the project area are generally deep, fine textured and well suited for vegetative production with steep slopes being the primary limitation on use. Erosion and mass movement are potential hazards associated with most soils in the area, due to fine textures. Soils on steeper slopes have slower infiltration rates, resulting in more surface flow and erosion. Mass movement on steep slopes is also a potential hazard, with Wetopa and Wesdy soil types having the highest potential hazard rating within the tract (see Table 3.8). Fine textures and high activity clays result in a moderate to high shrink swell hazard ratings for most soil types. At the leasing stage, the locations of surface uses are not known; therefore more detailed soil information at the sites proposed for disturbance, potential salvage depths, and volumes cannot be estimated. Location-specific soil resource data will be reviewed in more detail following if and when post-leasing surface use is proposed. These uses will be evaluated in subsequent NEPA analysis.



**Table 3.8. Summary of Soil Resources in the Modification Area**

| Map Unit Name  | Percent of Area | Dominant Soil Series               | Depth  | Hazard        |              |               | Considerations For Use  |
|--|-----------------|------------------------------------|--------|---------------|--------------|---------------|---|
|  |                 |                                    |        | Water Erosion | Shrink Swell | Mass-Movement |   |
| Cryochrepts - Cryoborolls; rubble land complex; 15-90% slopes              | 52              | Cryochrepts soil and similar soils | S - D  | L - H         | L            | L - M         | None noted.   |
|  |                 | Cryoborolls soil and similar soils | S - VD | H             | L            | M             | None noted.   |
|  |                 | rubble land                        |        |               |              |               | Large exposures of loose rock.  |
| Herm - Fughes - Kolob Family Complex; 25-40% slopes                        | 5               | Herm soil and similar soils        | VD     | L - H         | H            | L - M         | Steep slopes in some areas; high shrink-swell potential; slow permeability; high soil erosion hazard in steeper areas; moderate mass movement potential in steeper areas; clayey subsurface soil textures.  |
|  |                 | Fughes soil and similar soils      | D      | M - H         | H            | L - M         |   |
|  |                 | Kolob Family and similar soils     | VD     | L - H         | M            | L - M         | Steep slopes in some areas; moderate shrink swell potential; slow permeability; high soil erosion hazard in the steeper areas; subsurface rock fragments; clayey surface soil textures; clayey subsurface soil textures; moderate mass movement potential in the steeper areas. |
| Haploborolls - Ustochrepts - Rock outcrop complex, 40 to 99 percent slopes | 34              | Haploborolls soil                  | D-VD   | H             | M            | L-M           | Steep slopes, shallowness to bedrock in some areas, surface stoniness in some areas, high soil erosion hazard, subsurface rock fragments, moderate mass movement potential  |
|  |                 | Ustochrepts soil                   | S-D    | H             | L            | M             |   |
|  |                 | Rock outcrop                       | -      | -             | -            | -             | Exposed rock outcrop  |
| Shawa - Sandia family - Kolob family complex, 40 to 65 percent slopes      | 5               | Shawa soil                         | VD     | H             | L            | L-M           | steep slopes, high soil erosion hazard, moderate mass movement potential in the steeper areas, (Sandia family - subsurface rock fragments and slow permeability)  |
|  |                 | Sandia family soil                 | D      | H             | L            | L-M           |   |

| Map Unit Name  | Percent of Area | Dominant Soil Series     | Depth | Hazard        |              |               | Considerations For Use  |
|--|-----------------|--------------------------|-------|---------------|--------------|---------------|---|
|  |                 |                          |       | Water Erosion | Shrink Swell | Mass-Movement |   |
|  |                 | Kolob family soil        | VD    | H             | M            | M-H           | steep slopes, high soil erosion hazard, clayey subsurface soil textures, subsurface rock fragments, moderate shrink-swell potential, high mass movement potential in the steeper areas                        |
| <i>Cumulic Haploborolls, 1 to 3 percent slopes</i>   | 1               |                          | D-VD  | L             | L            | L             | limited available water capacity, subsurface rock fragments, spring runoff flooding   |
| -- Torriorthents, cool<br>- Rock outcrop, 35 to 90 percent slopes                                  | 3               | Torriorthents, cool soil | S-VD  | H             | M            | M-H           | slow permeability, steep slopes, shallowness to bedrock in some areas, limited available water capacity, high soil erosion hazard, clayey surface textures, high mass movement potential in the steeper areas |
| Depth Classes: S = Shallow; D = Deep; VD = Very Deep Hazard Ratings: L = Low; M = Medium; H = High |                 |                          |       |               |              |               |   |
| Source: Cryer and Hughes 1997  |                 |                          |       |               |              |               |   |

## **3.9 Soils Environmental Consequences**

### **3.9.1 No Action**

The tract would not be leased and no mining would occur; therefore, soil conditions would exist in their current state without effect. Ongoing natural processes and other existing land uses would continue.

### **3.9.2 Proposed Action**

The direct disturbances resulting from subsidence versus that from potential post-leasing surface use are expected to have notably different impacts. Assuming the Reasonably Foreseeable Mining Plan (Beginning of Chapter 3), impacts to the soil resource due to subsidence would include cracks and other surface manifestations in areas of shallow overburden, where surface rocks are brittle, or where soils are shallow over bedrock. Soil cracking is most likely to occur at the ends of individual longwall panels and over the gate roads where the land surface is left in a tensional state after mining. Subsidence cracks that might develop in soil or colluvium tend to self-heal due to sloughing and natural filling by soil material. This type of disturbance to soils at the surface are likely to heal a few years after mining is complete. Subsidence has potential to affect surface water channels and basins and could result in increased rates of erosion. Soil erosion within drainage basins and resultant sediment loading may be increased until ground movements associated with subsidence stabilize relative to natural conditions. Post-lease surface use of approximately 6 acres could occur over the life of the lease as a result of access roads, methane drainage, and related activities. Site specific

locations of potential surface activities are unknown, but are expected to be distributed throughout the lease modification area. Effects of post-leasing activities will be evaluated on their own merits if/when activities are specifically proposed.

These activities would be conducted in accordance with regulations administered by the CDMG. These regulations require detailed surface use plans that ensure the soil resource is salvaged prior to surface use and replaced as part of the reclamation processes. Measures would be developed and required as necessary to amend nutrient levels, control erosion, alleviate compaction, and mitigate other soil resource impacts, including those resulting from subsidence. However, even with implementation of these management practices, some soil loss may occur and disturbed soils may temporarily or permanently exhibit reduced productivity. At other sites, revegetation has been observed to be generally successful between two and five years after reclamation work is completed. Activities resulting in disturbance on steep or unstable slopes of soil types with high erosion or mass movement hazard may result in increased erosion or trigger land slides. These hazards and related effects of disturbance are more likely to be present where existing geologic hazards and steep slopes are present. Disturbances on these slopes may also prove more difficult to revegetate and stabilize during reclamation. The GMUG Forest Plan calls for limiting ground-disturbing activities on unstable slopes and highly erosive areas. Further, the Forest Plan recognizes special leasing stipulations may be required to prohibit occupancy on steep or highly erosive slopes; these

types of stipulations are proposed to be carried forward from the parent lease.

### 3.9.3 Cumulative Impacts

The acreage of soils proposed to be affected by surface disturbances on the coal lease tracts and exploration license areas totals approximately 90 acres. Approximately 68 acres of previous disturbances are associated with the existing Bowie No. 2 Mine with an additional 20 acres of disturbance planned under other proposed permits. At the Sanborn Creek/Elk Creek Mine, approximately 110 acres have been disturbed.

Soils in the modification area have and will continue to be affected by construction of exploration drill pads and temporary road construction from exploration activities (Chapter 3 Past, Present and Reasonably Foreseeable Actions). The areas would be reclaimed at the completion of use. Future methane drainage is expected to disturb approximately 6 acres of previously undisturbed land within the modification area.

Mining and subsidence would occur within the modification area, lowering the land surface. Surface-tension cracks may form at isolated locations within these areas. Additional surface facilities and temporary roads may be proposed and approved on lands west of the tract on lands currently being explored for coal reserves. These additional surface disturbing activities would affect the soil resource by displacing soils at specific locations. The topsoil and subsoil is stockpiled and reserved for reclamation. Contemporaneous reclamation techniques would be used, thus replacing the soils on the site as soon as the location is no longer needed. These activities would temporarily affect an

estimated 15 acres most of which has been previously disturbed.

Few adverse impacts to soils have been observed during subsidence monitoring at nearby mines. Reclamation of surface use sites, including methane drainage drill sites, exploration drill sites and associated temporary roads, has been generally successful in three to five years following reclamation. Reclamation typically includes regrading the surface to approximate original contour and revegetating with a specified seed mix. The area of surface disturbance in the region will temporarily increase during construction, returning to conditions similar to pre-disturbance following reclamation.

The area within and adjacent to the lease modification area contains numerous existing natural landslides and other unstable areas. These natural features when combined with surface disturbing activities and subsidence from existing and future coal mining would continue to contribute to localized increased sedimentation. In addition, if landslides and rockfalls are initiated or accelerated due to subsidence, increased sedimentation and erosion is likely to occur in those areas.

### 3.9.4 Conditions of Approval

No additional conditions of approval are recommended for soils other than those addressed in the parent lease. Proper soil management and reclamation measures are required by the surface management agencies on disturbed sites. Colorado DRMS would also require proper soil management procedures as part of their exploration and mine permits.

### 3.9.5 Consistency with Forest Plan and Other Laws

The Proposed Action is consistent with Forest Plan standards for geology which establishes limits on ground-disturbing activity on unstable slopes and highly erodible sites, and regulations adopted pursuant to the Surface Mining Control and Reclamation Act of 1977 and the State of Colorado's OSM-approved permanent program for coal mining per the Colorado Surface Coal Mining Reclamation Act as administered by the CDRMS with oversight from the OSM, which govern all direct effects of coal mining, including those that may impact geology. These acts and attendant regulations require that topsoil be removed, stockpiled, and replaced on reclaimed surfaces associated with construction or mining disturbance. Other impacts to the geologic resource that may occur as a result of mining, including landslides and erosion, must be mitigated to stabilize the surface and return the land to an approved post-mining land use.

### 3.10 Surface Water Resources Affected Environment

The study area required to address the impacts to surface water hydrology from leasing the COC-61209 Lease Modification is defined by the watershed boundaries of the local drainages (Figure 3.10 Surface Hydrology Map). The following sections include discussion of the regional hydrologic setting, flow characteristics within the surface drainage system, analysis of surface water quality, water rights, and environmental consequences mining on surface water resources. The following information sources were used for this evaluation:

- Surface water quality and quantity data for regional hydrology from the USGS;
- Surface water quality and quantity data for the Iron Point Lease modification from BRL;
- Surface water rights information for the drainages in the vicinity of the study area from the Colorado State Engineers Office, Division of Water Resources; and
- Review of BRL and Oxbow data, including annual hydrology reports, permit applications, and other reports related to surface water hydrology.

To respond to issues raised during scoping, effects of subsidence on Terror Creek Reservoir, Terror Creek and Hubbard Creek were included in the analysis. It should be noted that the Terror Creek Reservoir is not within the proposed Iron Point Coal Lease modification and is outside the area of influence defined by the subsidence angle of draw. See Figure 3.5 Anticipated Subsidence.

The Iron Point Coal Lease modification is located within the North Fork of the Gunnison River basin.

#### Regional Surface Water Hydrology

Hubbard Creek, within the lease modification area, drains to the North Fork of the Gunnison River. The North Fork of the Gunnison River joins the Gunnison River downstream of Hotchkiss. There are two USGS monitoring locations along this reach: North Fork of the Gunnison River near Somerset, Colorado (Station No. 09132500), and North Fork of the Gunnison River below Leroux Creek, near Hotchkiss, Colorado (Station No. 09135950). Stream flow has been

monitored at the station near Somerset since October 1933. The drainage area at the Somerset station is 526 square miles. The average annual mean flow is between 94 and 829 cfs with peak flow of 9,220 cfs.

Surface water quality in the North Fork of the Gunnison River in the vicinity of Paonia is good with low concentrations of TDS, nitrate, nitrite, and metals. The water is of calcium bicarbonate type.

### **Project Area Surface Water Hydrology**

Figure 3.10 Surface Hydrology Map shows the watershed areas that encompass the coal lease modification. Hubbard Creek and Terror Creek drain the lease modification area.

Hubbard Creek is a perennial drainage that has an estimated drainage basin area of 58.1 square miles. The main channel length is 17.60 miles long. Approximately less than 1% of the Hubbard Creek drainage basin lies within the lease modification area.

Terror Creek is a perennial drainage with a drainage basin area of 29.4 square miles. The main channel length is 12.35 miles long. Less than 1% of the Terror Creek drainage basin lies within the lease modification area.

Baseline water quality and flow data for the Bowie No. 1 and No. 2 mines has been collected for several years. Bowie has initiated additional baseline monitoring in the general area of the lease modification.

There are twelve surface water monitoring locations on Hubbard Creek and its tributaries. Instantaneous flow data and water quality data are monitored at each location. Surface

water monitoring locations are shown on Figure 3.10, Surface Hydrology Map.

### **Surface Water Quality**

BRL collects water monitoring samples at approximately 118 water sampling stations (both springs and streams) within the vicinity of the mine on a quarterly basis (except for winter months when inaccessible). Oxbow also collects data around its mine. Further information can be obtained from project and district files or from the mines in their Annual Hydrology Reports.

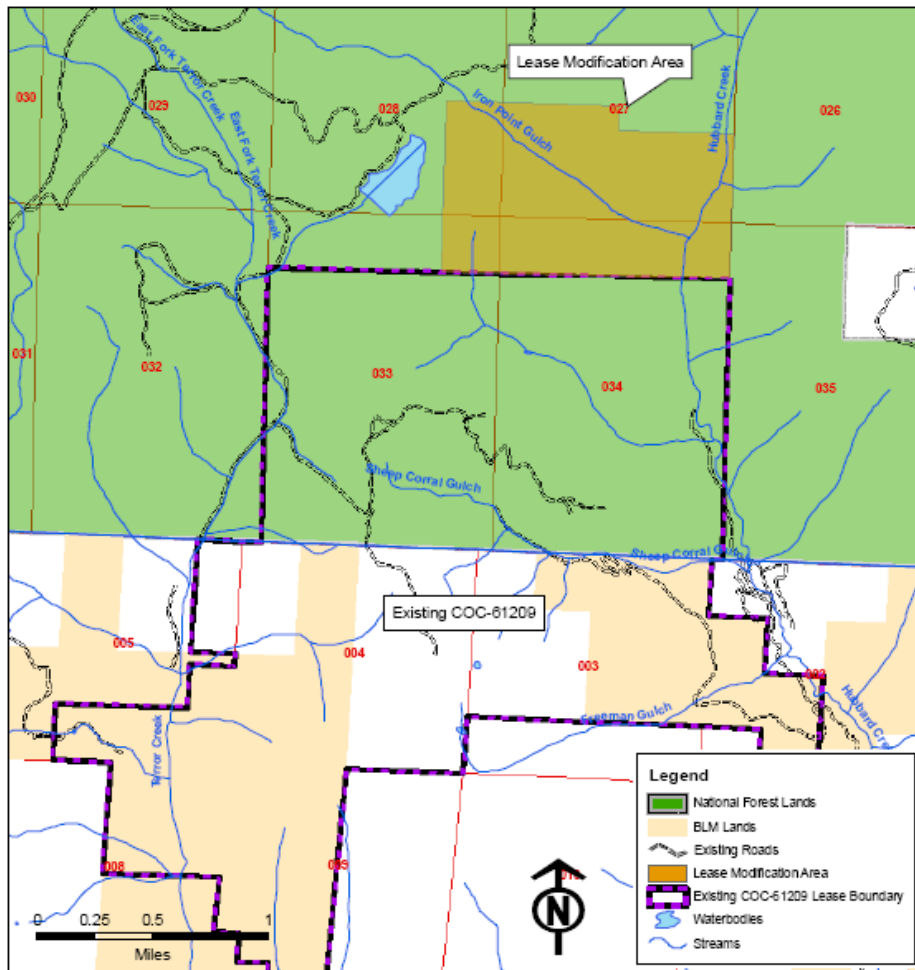
From previous management activities (see Section 3.1 Past, Present and Reasonably Foreseeable Actions) effects to surface water quality and quantity have been minimal.

### **Seasonal Trends in Surface Water Quality**

General seasonal trends in surface water quality were not obvious in reviewing the BRL or Oxbow water quality data. The relatively short period of record (approximately 10 years) likely explains the lack of significant trends. In general spring run-off from snow-melt significantly increases the sediment load and transport within the surface water system. Flows also increase dramatically during this period from March – June. For example, Hubbard Creek runs at approximately 1.7 cfs in August, whereas May flows are closer to 100 cfs.

Springs in the area typically show the same seasonality as the stream system.

**Figure 3.10. Surface Hydrology**



**Water Rights**

The study area is located within the Colorado Division of Water Resources Division 4, District 40. Water rights for this district were obtained from this agency. Water rights in an area bounded by a 1 mile buffer around the Iron Point Exploration License area and the Iron Point and Elk Creek Coal Lease tracts. Water rights originating from the North Fork of the Gunnison River between the

Sanborn Creek surface facilities area and the Bowie No. 2 Mine surface facilities are also included, even though they may be located more than 1 mile from the lease area boundaries. Water rights originating from Hubbard Creek or west of Hubbard Creek are considered in the lease modification area.

There are ten ditches originating from Hubbard Creek and its tributaries that

are located within the boundaries described above. Four of these ditch headgates, the Wade Allen Ditch, the Carl Galpin Ditch, the Pilot Knob Ditch, and the Carter Ditch, are located north of the lease modification area, but within 1 mile of the boundary. The Wade Allen Ditch headgate is located on Hubbard Creek.

The Carl Galpin Ditch headgate is located on Pilot Creek, tributary to Hubbard Creek. The Pilot Knob Ditch headgate is located just south of the Galpin Ditch headgate. The Carter Ditch headgate is located on Cottonwood Creek.

The Hubbard Creek Ditch headgate is located near the northern boundary of the modification area boundary on Hubbard Creek.

The Deertrail Ditch headgate is located on Hubbard Creek south of the lease modification. The Majnik and Mayes Ditches are located south of the Deertrail Ditch.

There are two reservoirs within the Hubbard Creek drainage basin. The Terror Creek Reservoir (known as the Bruce Park Reservoir in the water rights listing) is located near the northwestern corner of the lease modification area. The reservoir straddles the Hubbard and Terror creek drainage basins with a dam in each basin. The water source is Hubbard Creek; however, water from the reservoir can be released to either Hubbard or Terror creeks.

There are seven ditches, or canals, originating in the Terror Creek drainage basin. One canal, the Grand Mesa Canal No. 3, has a headgate located on the East Fork Terror Creek. It is located near the northwestern corner of the lease

modification area, northwest of the Terror Creek Reservoir. The Garvin Mesa Pipeline and the Hughes Pipeline are located immediately west of the lease modification area on an unnamed tributary to East Fork Terror Creek.

The remaining four ditches have headgate locations south of the Iron Point Coal Lease Tract on Terror Creek. The Terror Ditch headgate is located approximately south of the southernmost boundary of the lease modification. The Fire Mountain Canal (additional headgate), Fawcett Ditch, and the Holybee Ditch have headgates located near the confluence of Terror Creek with the North Fork of the Gunnison River. These ditches are all located more than 1 mile south of the lease modification area, but they were included because the water source could be impacted upstream by the proposed mining.

Seven ditches originating in the North Fork of the Gunnison River were also included because of the potential that the water source could be impacted upstream by mining. They are the Fire Mountain Canal, the Carol Ditch, the Jenkins Ditches No. 1 and 2, the Stewart Ditch, the Stephens Ditch, and an additional headgate for the Stewart Ditch.

#### **Influence of Past Mining on Surface Water**

Various National Pollution Discharge and Elimination System (NPDES) permits granted to BRL regulate impacts of current and historical mining on local streams.

Monitoring on the North Fork of the Gunnison River shows little impact to the water quality from current or historical mining. Subsidence impacts from past mining have been observed in



several areas where overburden is less than 500 feet thick. Although subsidence was observed in the form of cracks in the weathered bedrock and colluvium from 15 to 100 feet above the stream channel, there were no cracks observed in saturated alluvium underlying the stream. There was also no evidence of loss of flow observed.

### **3.11 Surface Water Resources Environmental Consequences**

Potential environmental consequences of leasing (and eventual mining of) the lease modification area includes the following impacts:

- Continued dewatering of the D coal seam could disrupt flow on some sections of Hubbard Creek, which are fed from the D seam;
- Water discharge from the mines to surface streams could impact the quality of water in the receiving streams; and,
- Continued use of surface facilities could increase sedimentation.

In addition, subsidence caused by longwall mining can potentially disrupt stream flow and ponds directly above the underground mine and within the angle of draw. Other mine subsidence impacts could include changes in drainage channel morphology resulting in changes in general surface gradients, which could lead to head cutting, pooling, soil erosion, and sedimentation.

Figure 3.5 Anticipated Subsidence Map describes the subsidence impacts within potential zones ranging from "very low to low" potential for subsidence, to "high to very high" potential.

#### **3.11.1 No Action**

Under the No Action alternative, there would be no mining-induced effects on water resources in the modification area. Current ongoing activities in the watershed as well as natural variation in spring and stream flow would continue to occur.

#### **3.11.2 Proposed Action**

Subsidence from mining may alter surface water hydrology by altering groundwater flow regimes, surface water drainages, seeps, and ponds. Subsidence under surface water drainages could result in changes in channel morphology and gradient, thereby affecting water quality by inducing minor cutting, pooling, soil erosion, and sedimentation. Surface-tension cracks have the potential to develop within the surrounding surface drainages, resulting in an initial period of erosion and sedimentation after initial periods of runoff after subsidence occurs. However, the potential for surface fractures to develop in drainages where unconsolidated materials occur will be partially mitigated by the ductile nature of the unconsolidated alluvium/colluvium.

Subsidence resulting from longwall mining can be expected anywhere above or within the angle of draw of fully extracted longwall panels. Measurable subsidence effects for the modification area are expected to attenuate within 250 feet from the edge of the longwall panels (assuming a 25 degree angle of draw).

Based on subsidence studies and observations from the West Elk Mine area made available in the Dry Fork LBA Subsidence Evaluation (Agapito 2005), measured subsidence values in the North Fork Valley are typically less than predicted subsidence magnitudes. Adverse impacts on surface water

drainages, ponds, springs, or seeps were not found in the three mines reviewed.

There are several springs inventoried in the modification area. All of the springs are located in/near the bottom of the main Hubbard Creek drainage or in the bottom of Iron Point Gulch. Groundwater that surfaces in these springs and seeps in the area is associated with shallow alluvial/colluvial deposits and does not appear to be hydrologically connected with deeper bedrock aquifers. Static water levels in bedrock aquifers in the Bowie #2 Mine area are many hundreds of feet below ground surface and show no connection to surface water sources. Based on the estimated overburden in the modification area, as well as the limited extraction zone in the Hubbard Creek drainage, and the maximum estimated fracture zone thickness above longwall panels (~200-350 feet; Maleki, 2007), it does not appear that the perennial springs will be affected by fracture zone-induced drainage. In addition, there is low risk of alluvial/colluvial springs being intercepted by subsidence-induced tension fractures. The lowering of the land surface may cause springs to migrate a few feet, but no discernable loss of water is anticipated.

Water usage from the National Forest for mining would be relatively minor and quantities would fall below the Forest's Biological Opinion for water depletions

Water discharge from the mine to surface streams could impact the quality of water in the receiving streams. Mine effluent would be regulated, and any discharge to receiving streams would have to meet permitted effluent requirements. Concentrations of TDS, iron, manganese, and sulfate could be constituents likely to increase.

Subsequent mining in exploration areas west of the modification could lead to indirect effects on the Terror Creek Reservoir. These include potential impacts to the structural integrity of the greater risk from seismic activity generated from collapse of historic room-and-pillar mines in the Somerset area, than from proposed longwall operations. However, a thorough review has been conducted by the Colorado State Engineers Office for this proposal and no objections to the proposal are anticipated due to the distance between the subsidence zone and the dam.

Pertinent findings in the Annual Hydrology, Subsidence, and Mine Inflow Report provided by the Forest Service (Stover 2003) are summarized below:

*“Survey data from various points over extracted longwall panels indicated 3.5 to 6.5 feet of subsidence has occurred, with 1.5 feet of subsidence observed over abutment chain pillars. These values correspond to a subsidence factor of 0.35 to 0.65 over supercritical longwall panels and 0.15 over rigid chain pillars for an assumed mining height of 10 feet. According to the subsidence report, this measured subsidence is consistently less than the predicted subsidence. In addition, hydrologic monitoring has shown no adverse impacts from mining induced subsidence to ponds, streams, springs, or ditches.”*

Special subsidence protection (i.e., limited extraction zones, barrier pillars, buffer zones, etc.) is required for those areas under Terror Creek and Hubbard Creek. Therefore, the effects of longwall mining would be negligible.

### **3.11.3 Cumulative Effects**

Leasing the coal in the modification area would extend the life of the Bowie #2 Mine, thereby increasing the potential for indirect impacts to surface water quality due to longwall mining related subsidence under ephemeral drainages and to springs/seeps within the area. However, current mining activity at the Bowie #2 Mine has had no discernable localized effects stream morphology, erosion rate, or suspended sediment load. Ephemeral surface water resources in smaller tributary drainages are limited to spring runoff and very large thunderstorm events; therefore, subsidence-induced impacts in these drainages would be minimal.

Due to the overriding influence of continued drought in the North Fork basin and the fact that creek flow is unlikely to be affected by subsidence or mine operations; it is unlikely that Forest Service water resource allocations for the watershed will be impacted.

Potential post-lease surface use (exploration drilling, methane drainage, ventilation shaft construction) has the potential to affect surface water through surface disturbance related to drill pad and road construction. Depending on location of these activities, construction could have impacts on sedimentation in stream channels, however these effects are mitigatable through use of best management practices, including sediment control. Any proposed post-lease activities would be analyzed under a separate NEPA analysis if/when activities are proposed.

Agriculture is an important and significant activity in the North Fork of the Gunnison Valley. Cumulative effects to surface water quality would be minimal in the North Fork of the

Gunnison River Valley. Under state law, the mine operator/lessee would be required to replace any water right injured as a result of mining activities. In addition, a Forest Service stipulation on the parent lease requires restoration of stream channels/drainages to protect stream flow in the event of damage.

Minimal logging is anticipated in this area in the future. Based on experience in the area, impacts to surface water would not be expected from small timber sales. Recreation is fairly limited in the area due to the lack of developed recreational facilities. Hunting is the primary recreational activity in this area, and impacts to streams from four-wheeling activity can result in increased sedimentation and damage to drainage channels.

### **3.11.4 Conditions of Approval**

Other than the water depletion which will be addressed in the Threatened and Endangered Species Section, no new conditions of approval other than those listed in the parent lease are recommended.

### **3.11.5 Consistency with Forest Plan and Other Laws**

This quantity of water for reasonably foreseeable future development is within the GMUG's blanket consultation with USFWS for depletion associated with the Upper Colorado River System. The previous restriction with respect to water resources was found to be applicable to the Proposed Action after applying the unsuitability criteria stipulated in the amended LRMP dated September 1991 for the GMUG National Forests. Proposed Action is consistent with the Clean Water Act and Forest Plan standards for water resources. The stipulations for water resources in Proposed Action are also consistent with

the FS Region 2 Water Conservation Practices Handbook and Ground Water Management FSM 2880.

### 3.12 Ground Water Resources Affected Environment

The study area for groundwater hydrology includes the region within a 1 mile radius of the proposed coal lease modification area. Particular attention was given to the area of potential subsidence induced impacts (see *Figure 14, Subsidence Potential Map*).

The analysis of groundwater hydrology includes wells, springs and seeps, and spring-fed stock ponds. Springs are defined as flowing at a rate of greater than or equal to one gallon per minute (gpm). Seeps flow rates are less than one gpm or are immeasurable. Information for this evaluation was derived from the following sources:

- Groundwater quality and quantity data for area wells and springs from Bowie;
- Oxbow, USGS, and Hotchkiss Ranches, as well as previous site visits;
- Water rights information from the Colorado State Engineers Office, Division of Water Resources;
- Review of coal mine data, annual hydrology reports, permit applications, and reports related to groundwater hydrology;
- Previous NEPA documents; and,
- Review of reports, data, and maps compiled by state and federal agencies.

### Regional Hydrogeology

The primary groundwater-bearing zones in the North Fork of the Gunnison River Basin occur in Quaternary alluvial, colluvial, glacial, and aeolian deposits and Cretaceous bedrock. Alluvial (river) deposits along the North Fork of the Gunnison River are saturated and considered to be an aquifer. Alluvial water-bearing units are thickest in the axis of the drainage bottoms and are typically 100 feet or less in thickness. The water quality of the alluvial groundwater is calcium bicarbonate type and is of good quality. The total dissolved solids (TDS) concentrations sometimes exceed federal drinking water standards. Well yields from this zone range from 1 to 150 gpm and average about 20 gpm (Ackerman and Brooks, 1985).

Colluvial water-bearing units located on valley slopes are generally isolated and are limited in extent. These units are normally saturated seasonally and have a low storage capacity and yield. Most springs and seeps in the region issue from colluvial deposits underlain by less permeable bedrock. Seasonal spring discharge from colluvial deposits ranges from 0.2 to 20 gpm and averages 5 gpm. Colluvial deposits do not represent an aquifer in the region, and no reported wells are developed in this zone. However, numerous seasonal springs and seeps issuing from these zones have been developed for livestock watering (stock ponds) and support wildlife.

The primary bedrock water-bearing zones in the North Fork of the Gunnison River basin are in the sandstone and conglomerate units and fractured zones of the Lower Cretaceous Burro Canyon Formation and Late Cretaceous Dakota Sandstone. Minor groundwater occurrence is reported in the Late

Cretaceous Mancos Shale, Mesa Verde and Tertiary Wasatch Formations. Saturated bedrock units are generally confined in nature, except near outcrops. Well yields from the Burro Canyon Formation/Dakota Sandstone are generally greater than 10 gpm (Ackerman and Brooks, 1985). Groundwater from the Mancos Shale, while unsuitable for drinking or agricultural use, has yields that range from 0.5 to 15 gpm (Ackerman and Brooks, 1985). Wells completed in the Mesa Verde Formation typically yield less than 10 gpm (Ackerman and Brooks, 1985). Limited data from wells completed in the Wasatch Formation indicate yields as high as 25 gpm (Ackerman and Brooks, 1985). No data is available for other Tertiary age deposits in the region. Spring flow from the Mancos, Mesa Verde, and Wasatch formations ranges from 1 to 25 gpm, with an average of 10 gpm (Ackerman and Brooks, 1985).

Water-bearing zones are recharged through seepage from area streams, direct infiltration of precipitation, and snowmelt. Alluvial water-bearing zones are hydraulically connected to adjacent bedrock and intermixing of the two units with groundwater is likely (Ackerman and Brooks, 1985). The shallow alluvial and colluvial groundwater flow follows local topography.

The regional bedrock groundwater flow direction is northeast following the regional geologic dip of about 5 degrees. Locally, bedrock groundwater flow paths follow topography and are affected by numerous drainages bisecting the region.

### **Mine Site Hydrogeology**

Groundwater occurs within the proposed coal lease modification in the Quaternary alluvial and colluvial

deposits, Wasatch Formation, and Mesa Verde Formation. Saturated alluvium along the North Fork of the Gunnison River and primary tributary drainages (Terror and Hubbard creeks) has been developed for industrial, domestic, and livestock use.

Area wells yield ranges from 5 to 120 gpm and average 17 gpm. Several domestic wells are located at the mouths of Terror and Hubbard creeks.

Saturated alluvium is unconfined and is recharged primarily by seepage from rivers and streams and, to a minor extent, by discharge from water-bearing bedrock and direct precipitation. Groundwater flow gradient in the alluvium follows the local drainage topography.

Water-bearing colluvial deposits are found along the slopes of area drainages and on the gentle terrain of the ridge tops, as noted by the occurrence of numerous seasonal springs and seeps. These saturated deposits are perched, limited in lateral extent, and are not considered significant water resources. However, several local stock ponds are constructed to collect the seasonal spring flow. Local springs and seeps issue from these zones during periods of high precipitation and snowmelt. Seasonal spring and seep flows range from less than 1 gpm to about 5 gpm and are reported to be dry from summer to spring except after major precipitation events. Direct precipitation and snowmelt recharge these deposits. Groundwater is unconfined, and the flow direction follows the local topography.

The Wasatch Formation outcrops on the gentle ridge tops of the lease modification area. Groundwater occurrence has been identified from numerous seeps and springs. These springs are generally perennial and are

associated with thin sandstone outcrops overlying shale or claystone beds. Flow rates typically decrease during the summer and fall seasons (personal communication with Dan Hudson of Hotchkiss Ranches). Springs and seeps also issue from landslide deposits in the Wasatch Formation where slumping has juxtaposed permeable strata with low permeable material. Slumping features also form catchments that hold snowmelt runoff enhancing recharge potential. Springs that issue from landslide deposits are ephemeral, flowing only during the wet season and during periods of high precipitation (personal communication with Dan Hudson of Hotchkiss Ranches). The saturated zones in the Wasatch Formation are considered perched and with limited storage potential.

Based on mining and drilling data and spring and seep surveys, groundwater in the Mesa Verde Formation is limited to isolated sandstone beds in the barren and coal bearing members, the Rollins Sandstone member, various coal beds, and along fault and fracture zones. Low primary permeability and limited storage capacity of the Mesa Verde Formation hydrogeologic units limit potential groundwater resource development (Brooks, 1983). However, significant quantities of groundwater are reported where the Mesa Verde Formation is fractured. The D coal seam is apparently saturated on the west side of Hubbard Creek as indicated by numerous springs and seeps. Spring flows range from less than 1 gpm to about 25 gpm with flow decreasing during dry seasons. Direct precipitation and snowmelt infiltration recharge these deposits. Seepage from local streams provides little recharge due the steep stream gradients and gaining character in the upper drainages where these units outcrop. Groundwater is

unconfined near outcrop and semi-confined to confined in deeper subsurface strata. Groundwater flow direction follows the local topography near drainages and flows to the northeast (regional geologic dip of about 5 degrees) in other areas.

A summary of the spring and seep data is presented in BRL's Annual Hydrology Report and Annual Mine Inflow Report located in the project file.

Current and historic mining in the area have encountered groundwater in the coal seams and adjacent strata. The Bowie No. 2 Mine is currently developed in the D seam and reports inflows of less than 5 gpm (BRL, 2008).

The Sanborn Creek Mine (Oxbow) is developed in the B and C seams with average inflows of 100 gpm and peak flows of 250 gpm near fractured zones. This mine is situated below the outcrop/sub-crop of the North Fork of the Gunnison River.

The Oliver Mine was developed in the D seam mostly above the outcrop/sub-crop with Elk Creek. Historic information indicates mostly dry conditions with inflows ranging from 0 to 6 gpm (Oxbow, 1999).

Seeps and springs issue from coal seam outcrops, particularly on the north and east sides of local drainages. The most notable site is located in middle Hubbard Creek drainage where springs and seeps from the D seam outcrops create a marshy area. Increased groundwater flow potential is expected near fault and fractured zones in all of the water-bearing strata of the area. However, little information is currently available to confirm this, except where mining operations have crossed fault zones. The Bowie mines have been typically relatively dry, even in fractured terrain.

## **Groundwater Quality**

Bowie and Oxbow have collected groundwater quality data for the past several years. Bowie has long term data from monitoring wells and springs at the Bowie No. 1 Mine on the west side of Terror Creek. Bowie has also collected baseline data from numerous springs and wells near the Bowie No. 2 Mine and within the lease modification area.

A summary of water quality data is presented in BRL's Annual Hydrology Report and Annual Mine Inflow Report located in the project file. Review of BRL water quality data from monitoring wells and springs does not reveal any general seasonal trends in groundwater quality at the study area. This is likely due to the relatively short period of record for most sampling sites. Alluvial well data has been collected quarterly since 1997. Bedrock monitoring well data has been collected since 1995, and spring data has been collected sporadically since late 1997. Seasonal groundwater quality trends will likely become more defined when more consistent water quality data becomes available. Typically, seasonal trends include increased concentrations of TDS and dissolved constituents and high groundwater levels in the spring.

Past and current mining activities have affected groundwater quantity and quality. Current mining activities at the Bowie No. 2 Mine does not utilize any groundwater for operations (it uses adjudicated water rights in Deertrail Ditch). As a result, there have not been any impacts to groundwater due to water consumption. Since 2004, there has been between 5 gpm and 25 gpm inflow into the mine from non-point sources in the D and B coal seams, although, no dewatering activities have occurred.

Historic mining activities at the King Mine in the drainages below the Bowie No. 2 Mine have impacted the local alluvial groundwater quality. Seepage from the King Mine has caused high sulfate and other trace constituent levels in groundwater at the down gradient alluvial monitoring wells (AW-1, 3, 4, 5, and 6). No other impacts have been noted in this area.

Past and current activities other than mining have also affected groundwater quality. Livestock grazing causes minor impacts to springs and seeps due to erosion, sedimentation, and water quality (i.e. fecal coliform). Unauthorized off-road vehicle use also causes erosion and sedimentation that effect spring areas. Individual domestic water wells and community water wells have had limited impact on groundwater quantity. Rural septic systems may impact local groundwater quality.

## **Groundwater Use**

Water rights and well records from the Colorado Division of Water Resources were reviewed for the area of the proposed coal lease modification area, and areas extending about 1 mile outside of these boundaries. There are five adjudicated water rights associated with springs near the lease modification area. Four adjudicated water rights are on private surface (J&M Spring and Pipeline 1- 4) and one is on BLM surface (J&B Spring and Pipeline 5). These sites are used for stock watering purposes.

Six adjudicated water rights associated with wells are near the lease modification area. All but the Blue Ribbon well are located along the North Fork of the Gunnison River and are apparently installed in saturated alluvium. The Blue Ribbon well is located in Hubbard Creek and has not

been in use since the Blue Ribbon Mine was closed.

The King Clay well is located on the West Fork Terror Creek. This shallow well is installed in the alluvium along West Fork Terror Creek and is for domestic use. The Peggy Seabloom well is located on the East Fork Terror Creek, about a mile west of Terror Creek Reservoir. This shallow well is installed in the alluvium along East Fork Terror Creek and is for domestic use.

### **3.13 Ground Water Resources Environmental Consequences**

Longwall mining causes bedrock fracturing and land subsidence above longwall panels. By potentially providing pathways for groundwater to move downward toward the mined horizon, fracturing and subsidence may divert water from saturated horizons and surface water bodies above and adjacent to caved areas. Impacts to groundwater systems may potentially result in the decrease in natural discharge rates from springs and seeps or change water levels and yields in area wells. Potential effects include the following.

Mining would dewater the coal seam and water-saturated horizons immediately above and below the coal seam.

Water quality could be degraded when groundwater flows through active or abandoned mine workings.

Trans-basin diversion of groundwater resulting from dewatering of the coal seam is a potential impact.

Water rights could be affected if area spring flows and associated pond levels and well water levels are diminished.

Increased sedimentation of area springs from construction and use of surface

facilities (exploration drill pads and associated access roads) could occur.

Accidental fuel or solvent spills could impact shallow groundwater locally. The criteria for significant impacts refer to adverse impacts to the quality or quantity of groundwater utilized for important uses such as domestic water supply, livestock watering, springs that recharge wetland/riparian areas or support wildlife habitat, and natural resource values.

Subsidence induced impacts to groundwater resources were calculated from the reasonably foreseeable development scenarios and generalized overburden strata characteristics for the lease modification area. It was also assumed that coal would be extracted using longwall mining techniques so that subsidence occurred within the limits of the lease modification boundary.

The strata are not uniformly saturated, so there is little concern for inter-aquifer communication for installing gob vent boreholes as they would be of small diameter and would cause little disturbance to the geologic strata.

#### **3.13.1 No Action**

Under the No Action alternative, there would be no increased mining-induced effects on water resources in the lease modification area. Current activities in the area, along with natural variation in spring and seep flow would occur based on climatic variations.

#### **3.13.2 Proposed Action**

Shallow groundwater in the modification area is limited due to geomorphologic controls from the relatively steep gradients and stream profiles of drainages, resulting in thin alluvial/colluvial deposits confined to the drainage bottoms. Groundwater that



surfaces as springs and seeps in the area is associated with these shallow alluvial/colluvial deposits and does not appear to be hydrologically connected with deeper bedrock aquifers.

Groundwater may also be present to a limited extent within coal seams. Bedrock and associated coal seams dip to the northeast, with the uppermost strata outcropping along the North Fork Valley. The occurrence of groundwater springs in the North Fork outcrops of the Mesa Verde formation is rare. BLM and Bowie report that the coal seams in the mine area are typically dry, with average moisture content of 5 percent. Groundwater discharges from faults intercepted by longwall panels in the mine have experienced initially high volume discharge periods followed diminishing to negligible flow within a short time period.

No effects to surface water resources have been documented from interception of water-bearing faults underground. Not all faults encountered during mining have contained water. Mine under-drain and mine inflow sites are currently monitored for flow and water quality by the Bowie No. 2 hydrologic program. The total inflow for the Bowie #2 Mine is ranging from 5 to 50 gallons per minute (2007 Bowie Annual Hydrology Report) depending upon working area. Any groundwater encountered would be handled by the existing system in the Bowie underground operation. Discharge water would be required to meet the NPDES and Colorado Discharge Permit System (CDPS) surface water quality standards. It is difficult to assess mining-related effects of groundwater interception and withdrawal on regional water supply due to ongoing drought conditions in the region. Yearly decreases in annual stream flow in both Hubbard Creek and

the North Fork of the Gunnison River during the period between 2001 and 2007 document ongoing drought conditions.

Longwall mining development of lease modification would induce subsidence of the overlying ground surface. The extent, severity, and potential impact to groundwater due to subsidence is dependent on the thickness, composition, and geotechnical properties of the overburden, thickness of the mined coal, and mining plans. Subsidence-induced impacts to groundwater are primarily related to the break angle. The break angle defines the zone of maximum strain above a mining panel. Subsidence induced impacts to groundwater in the modification area are rated low to very low because thickness above the coal seam to be mined is greater than 1,000 feet. Figure 3.5 Anticipated Subsidence, Map illustrates the potential zones of mining induced subsidence impacts to water resources.

It is believed that the B coal seam horizon is largely unsaturated in the lease modification. As a result, active mine dewatering would not be necessary and there would be no associated impacts. Post-mine flooding of the B coal seam is not expected because this horizon is naturally unsaturated. No additional groundwater quantity or quality impacts are expected.

Longwall mining development in the B seam of the lease modification would induce subsidence of the overlying ground surface and temporarily dewater the strata adjacent to the B coal seam. Mined areas would likely refill with water to approximate pre-mining levels after mining operations cease which could impact groundwater quality through exposure to collapsed and abandoned mine workings. No

subsurface water rights are located in the areas of potential impacts.

Subsidence could potentially disrupt or alter springs, seeps, ponds, and change local groundwater levels directly above the underground mine and within the angle of draw.

The potential for indirect groundwater impacts in the study area is expected to be minimal. Private domestic wells would be drilled and septic systems would be installed. Appropriate state and county regulations would have to be followed, minimizing impacts to groundwater quantity and quality.

Methane release from coal mines would not be expected to impact domestic water wells because the wells are below the coal seams to be mined.

### **3.13.3 Cumulative Effects**

Activities contributing to cumulative effects can be separated into several categories: mining, agriculture, other water uses (municipal/residential). Current mining activity in the North Fork of the Gunnison River Valley includes the Bowie No.1 Coal Loadout, the Bowie No. 2 Mine, the Sanborn Creek Mine, , and the West Elk Coal Mine. The Bowie No. 1 Mine is permitted for mining, but is inactive. Cumulative effects to ground water from mining activities include minimal impacts to water quantity and quality in the area and water use via adjudicated water rights. Multiple seam mining would have a cumulative effect in regard to subsidence. The subsidence impacts evaluation calculates that maximum vertical displacement would be equal to the sum of the potential displacements from mining individual seams. The potential subsidence impacts to groundwater resources would essentially be minimized due the great overburden

thickness relative to the total mined thickness.

Agriculture is an important and significant activity in the North Fork of the Gunnison Valley and groundwater is sometimes used for irrigation purposes and affects groundwater quantity and quality.

Cumulative effects to ground water quality would be minimal in the North Fork of the Gunnison River Valley. Under state law, the mine operator/lessee would be required to replace any water right injured as a result of mining activities.

### **3.13.4 Conditions of Approval**

No new conditions of approval other than those listed in the parent lease are recommended.

### **3.13.5 Consistency with Forest Plan and Other Laws**

Proposed Action is consistent with the Clean Water Act and Forest Plan standards for water resources. The stipulations for water resources in Proposed Action are also consistent with the FS Region 2 Water Conservation Practices Handbook and Ground Water Management FSM 2880.

## **3.14 Vegetation Affected Environment**

R2Veg GIS data as of 07 March 2008 was used in this analysis to describe existing vegetation within the project area. Due to the extent of aspen decline in the area, a large portion of the landscape in the vicinity of Terror Reservoir was updated in R2Veg over the course of the winter in 2007/2008. It is anticipated that additional aspen will decline in 2008 and beyond, and that the affected aspen stands may constitute a

much larger portion of the analysis area than they do as of the date of this EA.

The analysis area is the geographic footprint of the lease modification. To adequately assess cumulative effects of past, present and reasonably foreseeable future projects, including all new ground disturbance is the immediate area buffered by one mile. Existing vegetation at the analysis scale (project footprint with a 1 mile buffer), is shown in Table 3.14.

Habitats in the project vicinity are dominated by Gambel oak (*Quercus gambelii*) and associated vegetation, followed by pockets of aspen and spruce-fir forest. Areas proposed for road locations and well pad sites are predominately oak vegetation types, with one pad site in pinyon-juniper, one bordering spruce-fir and oak, and in the proposed development for the lease modification area, one new site in aspen. As none of these habitats are within the LAU and are not suitable for lynx, quantitative discussion of overall habitat changes will be done in the Biological Evaluation for this project.

The project area is at 6400 to 8100 feet of elevation.

## **3.15 Vegetation Environmental Consequences**

### **3.15.1 No Action**

No direct human-caused change in existing condition of current vegetation is anticipated if no action is undertaken for this project. Other projects in the surrounding areas, however, will likely occur and may have impacts to vegetation within the project area. Condition trends will continue as they currently exist, modified as per other

actions occurring on the landscape. Continued aspen decline is expected to occur and may have substantial impacts to the quantity and health of aspen stands and surrounding areas in the short-term (less than ten years). In addition to the aspen decline, succession of conifers within aspen stands would be expected to continue. This succession and would take place over many decades.

### **3.15.2 Proposed Action**

There are no Threatened, Endangered or Candidate, Sensitive, or Management Indicator plant species in the project area and, therefore, no effects to special status species will occur with the Proposed Action.

Except where subsidence occurs and destroys or uproots individual plants, there would be no impact to vegetation communities to implement the proposed action.

Other projects in the surrounding areas, however, will likely occur and may have impacts to vegetation within the project area. Condition trends will continue as they currently exist, modified as per other actions occurring on the landscape. Continued aspen decline is expected to occur and may have substantial impacts to the quantity and health of aspen stands and surrounding areas in the short-term (less than ten years). In addition to the aspen decline, succession of conifers within aspen stands would be expected to continue. This succession and would take place over many decades.

**Table 3.14 Bowie Projects Existing Vegetation Data**

| Vegetation (R2Veg Cover Type) | Action Area (project footprint with 1 mile buffer) acreage |
|-------------------------------|--|
| Forbs                         | 7.54   |
| Grass                         | 32.21  |
| Bare Ground                   | 65.50  |
| Gambel oak (shrub)            | 4647.21  |
| Mountain Shrub                | 3.10   |
| Aspen                         | 1265.48  |
| Cottonwood                    | 46.16  |
| Douglas Fir                   | 105.70   |
| Pintyon-Juniper               | 55.39  |
| Spruce-Fir                    | 626.18   |
| Water                         | 30.09  |
| Total Known                   | 6884.56  |
| Unknown*                      | 383.59   |
| Total Area                    | 7268.15  |

\*A portion of the analysis area is outside of existing R2VEG information, and is not used in the calculations for this project.

**3.15.3 Cumulative Effects**

Actions which have occurred in this area previously are primarily related to coal exploration, and have accounted for the current road system within the area. The FACTS database shows one vegetation project within the analysis area, a 479-acre prescribed burn in 1979. Vegetation in this area has largely regrown and effects of this fire are no longer noticeable on the landscape in most areas.

The Terror Creek Applied Silvicultural Assessment Project (currently being analyzed separately) includes one unit partially within the analysis area for this project.

The WAPA power line borders the western edge of the analysis area, and

future actions related to its maintenance and protection may occur within the analysis area for this project.

Other federal actions which have occurred in the past and are expected to occur in the future include permitted livestock (currently cattle) grazing and permitted outfitter/guided hunting. Road and trail maintenance is expected to continue within the area at a minimal level, except that done by the coal companies to access their facilities. Non-federal actions occurring in the area within the last ten years include recreational hunting, ATV, motorcycle, and mountain bike riding on existing roads and trails, dispersed camping (5 known sites, primarily associated with hunting), and nonspecific dispersed recreation. Water development (reservoirs, ditches) occurs on federal

lands in the area, specifically the Terror Ditch, which drains portions of the Hubbard Creek drainage to the north, and Terror Reservoir.

Table 3.15.3 shows individual components of the cumulative actions and affected vegetation resulting from those actions. Road clearing width is

assumed to be 25' for consistency, and pad widths are as noted in the proposed action. Some elements of the proposed action already exist, or are duplicated in portions of the proposals, and those are taken into consideration in the values below.

**Table 3.15.3. Vegetative Cumulative Effects**

| Action  | Vegetation Type                         | Acres Impacted |
|---|---|----------------|
| Gob Vent Borehole Road Construction (3.3 miles)   | Gambel oak (shrub)                      | 9.2            |
|   | Pinyon-Juniper sapling/pole, cover <40% | 0.1            |
|   | Spruce-fir sapling/pole, cover 40-70%   | 0.7            |
| Gob Vent Borehole Pad Construction (N=7)*   | Gambel oak (shrub)                      | 3.5            |
|   | Pinyon-Juniper sapling/pole, cover <40% | 0.7            |
|   | Spruce-fir sapling/pole, cover 40-70%   | 0.7            |
| Lease Modification Foreseeable Road Construction (Estimated values for new disturbance**) | Gambel oak (shrub)                      | 0.5            |
|   | Spruce-fir sapling/pole, cover 40-70%   | 0.5            |
|   | Aspen sapling/pole, cover 40-70%        | 0.25           |
| Lease Modification Foreseeable pad construction (Estimated values for new disturbance***) | Aspen sapling/pole, cover 40-70%        | 0.7            |
| Jeep Trail Exploration Road Construction  | Gambel oak (shrub)                      | 2.0            |
| Total Habitat Modification  |   | 18.85          |

\* Two pads already exist.

\*\* A portion of the road location has been previously built and rehabilitated.

\*\*\* One pad location has been previously built and rehabilitated.

### **3.15.4 Conditions of Approval**

No new conditions of approval other than those listed in the parent lease are recommended.

### **3.15.5 Consistency with Forest Plan and other Regulations**

Proposed Action is consistent with the Forest Plan, NFMA, FSM 2670 at 2670.22 - Sensitive Species, Executive Order 11990 - Protection of Wetlands, and Executive Order 131120 - Invasive Species.

## **3.16 Threatened and Endangered Wildlife & Aquatic Species**

A county-by-county species list was emailed to the district by the US Fish and Wildlife Service on 19 February 2008 (USDI 2008). There is only one federally listed terrestrial species that has the potential to be found in the project area, the Canada lynx.

Other species considered are shown in Table 2. As these species do not occur in the project area and no habitat for

them will be impacted by the project; therefore, these species were not further analyzed. These species would all have no effect determinations. There are four fish species which do not occur in the area, but for which water depletions associated with projects constitute an adverse effect. These four species are discussed herein. Water depletion associated with this project is consistent with the programmatic document developed for small water depletions (< 100 acre-feet per year) associated with numerous mineral development projects located on the GMUG NF (USFWS May 25, 2005, amended April 27, 2007 #ES/GJ-6\_CO-99-F-033-CP062).

Therefore, the GMUG will not request a Biological Opinion, and instead follow the terms of the agreement by reporting the end of January each year the amount of water used in the preceding year.

No consultation has been conducted with the USFWS on this project at this time as either no effect determinations exist or effect determinations are covered by programmatic Biological Opinions.

**Table 3.16. Federally Threatened and Endangered or Candidate Species considered for project.**

| Species                          | Scientific Name                    | Impacted by project? | Habitat Description and Requirements  |
|----------------------------------|------------------------------------|----------------------|---|
| Canada Lynx                      | <i>Lynx canadensis</i>             | No                   | Spruce/fir, mixed conifer, lodgepole pine forest (primary), or mixed deciduous/conifer (secondary)  |
| Black-footed ferret              | <i>Mustela nigripes</i>            | No                   | Coincident with prairie dogs, its primary prey. Not known or expected to occur on the GMUG.   |
| Yellow-billed cuckoo (Candidate) | <i>Coccyzus americanus</i>         | No                   | Low elevation river corridors, cottonwoods. Project actions will not impact suitable habitat.   |
| Clay-loving wild buckwheat       | <i>Erigonium pelinophilum</i>      | No                   | Specific microhabitats along toe slopes in adobe soils of Mancos shale in sage and shadscale near 5270' elevation. Not known or expected to occur on the district.                                |
| Uinta Basin Hookless Cactus      | <i>Sclerocactus glaucus</i>        | No                   | Grows on fine-textured soils derived from Mancos shale in shadscale, greasewood and juniper community types at elevations generally near 5,000 ft. No known or expected to occur on the district. |
| Greenback cutthroat trout        | <i>Oncorhynchus clarki stomias</i> | No                   | Recently confirmed populations (through genetics testing, June 2008) above project area in Hubbard Creek.   |
| Bonytail chub                    | <i>Gila elegans</i>                | Yes                  | Colorado and Gunnison Rivers  |
| Razorback sucker                 | <i>Xyrauchen texanus</i>           | Yes                  | Colorado and Gunnison Rivers  |
| Humpback chub                    | <i>Gila cypha</i>                  | Yes                  | Colorado and Gunnison Rivers  |
| Colorado pikeminnow              | <i>Ptychocheilus lucius</i>        | Yes                  | Colorado and Gunnison Rivers  |

## **Assumptions**

For this analysis, all project design standards and mitigation measures described in the proposed actions above were considered. While none of these are specific to lynx, they may result in changes to timing or other alterations to project activities. In addition, the reasonably foreseeable development for the lease modification area is assumed to be as indicated on the maps. As pad sites are largely restricted by topography in this area, the locations are thought to be accurate.

### **3.16.1a Canada Lynx Affected Environment**

The Canada Lynx was listed as threatened in March 2000. In August 2004, the Second Edition of the Canada Lynx Conservation Assessment and Strategy (LCAS) was released, to provide a consistent and effective approach to conserve Canada lynx on federal lands. The Canada Lynx Conservation Agreement (USDA 2005) identifies the Science Report (Ruggiero et al. 2000) and the LCAS (Ruediger et al. 2000) as including the best available science on habitat and conservation measures. Both of these documents, along with local information are to be used for project analyses.

Following release of the LCAS, the Forest mapped lynx analysis units (LAUs) and habitat within them, based on Regional direction. Habitat was mapped based on existing vegetation information, including vegetation type, canopy closure and size of trees. Areas outside of LAUs are not considered to be lynx habitat, even though they may contain habitat components or stands similar to those within LAUs.

The LCAS includes direction about limiting the amount of currently unsuitable habitat within a LAU (less than 30%), as well as maintaining at least 10% of the suitable habitat as denning habitat. Currently, 0.05% of lynx habitat within the LAU is unsuitable, and 35.4% of the lynx habitat is denning habitat. Table 3.16.1 shows current lynx habitat within the LAU.

Lynx breed in March and April in the north, and kittens are born in May and June in the Yukon (Ruediger et al. 2000). Den surveys in May and June 2005 in Colorado found kittens in the dens at that time (CDOW 2005a). Of the 16 dens surveyed in 2005 in Colorado all were found at high elevations from 10,226 to 11,765 feet. No denning habitat occurs within or immediately adjacent to any project activities.

Lynx have been described as being generally tolerant of humans, including moderate levels of snowmobile traffic (Ruediger et al. 2000). In a lightly roaded study area in northcentral Washington, logging roads did not appear to affect habitat use by lynx. In contrast, a study in the southern Canadian Rocky Mountains found that lynx crossed highways within their home range less than would be expected (Ruediger et al. 2000).



**Table 3.16.1. Crater Lake Lynx Analysis Unit Existing Condition (rounded to nearest acre)**

| LAU Name                  | Total Acreage | Suitable Habitat | Acres Denning Habitat/Winter forage (% of lynx habitat) | Acres Additional Winter Foraging Habitat (% of lynx habitat) | Acres Other foraging Habitat (% of lynx habitat) | Acres Currently Unsuitable Habitat (% of lynx habitat) | Acres Non Habitat (% of LAU) |
|---------------------------|---------------|------------------|---|--|--|--|------------------------------|
| Crater Lake               | <b>46399</b>  | 35992            | 12750   | 7111 (19.7)  | 16110  | 19   | 10408                        |
| LAU                       |               |                  | (35.4)  |  | (44.7)   | (0.05)   | (22.4)                       |
| Potentially impacted area | <b>4</b>      | 0                | 0   | 0  | 0  | 0  | 4                            |

Lynx have been reintroduced to southwestern Colorado, beginning in 1999. Tracking of these lynx indicate that lynx are using or moving through the Forest, but only a few of the relocations lie within or adjacent to the project area (CDOW 2005). Of the total 218 adult lynx that have been released in Colorado, there are 98 known mortalities (CDOW 2007). The cause of death is unknown for a third of these, but the two leading known causes of mortality are starvation and being hit by a vehicle. Speed has been identified as the primary factor contributing to vehicle-wildlife collisions (Gunther et al. 1998). None of the roads on the Forest are built as high-speed roads, and vehicle collisions are not expected to be an issue for this project. Project activities are anticipated to extend into archery, muzzleloader, and rifle big-game seasons, which could cause conflicts with hunters during these seasons. The disturbance associated with logging and hauling is likely to decrease the hunting pressure in this area, which could reduce the possibility of an illegal or accidental shooting of a lynx in this area. In addition, Colorado Division of Wildlife has provided hunter education on lynx identification as a measure to reduce the likelihood of accidental lynx kill. There are no landscape linkage areas in or near the project area or any travel routes associated with the project.

The Recovery Outline (USDI FWS 2005) identifies core areas, secondary areas and peripheral areas, based on historical and current occurrence records, as well as confirmed breeding. The Southern Rockies (Colorado and Wyoming) were identified as a Provisional Core Area. This designation was identified because this area contains a reintroduced population. Reproduction has been documented but it is too early

to determine whether a self-sustaining population will result. One litter of kittens has been born to the offspring of reintroduced lynx (CDOW 2006).

In November 2005, the FWS proposed critical habitat for lynx (USDI FWS 2005a). In 2006 Critical habitat for the lynx was designated, with none occurring on or near the GMUG (USDI 2006). A revised critical habitat designation which does not include lands within Colorado has been proposed (USDI 2008).

Extensive stands of pure aspen may not provide quality hare (primary prey) habitat due to deficiencies in winter habitat characteristics. However, when mixed with spruce/fir, aspen (especially younger stands) may substantially contribute to prey productivity (Ruediger et al. 2000). Lynx transplanted into Colorado were frequently located in well developed riparian and valley wetland shrub habitats of the upper montane and subalpine zones. These ecotones may provide quality foraging habitat for lynx. All of the 2005 dens were scattered throughout the high elevation areas of Colorado, south of I-70. Most of the dens were in spruce/fir forests in areas of extensive downfall. Elevations ranged from 10,226 to 11,765 feet (CDOW 2005a).

### **3.16.1b Canada Lynx Environmental Consequences**

Only a very small portion of the project is within the Crater Lake LAU, and potential impacts of the project to lynx are limited to habitats which are not suitable for lynx and have no potential to become habitat for lynx. Access to project areas is by currently existing roads, some of which are within the LAU. This road access is not anticipated to substantially alter current condition or use of habitat near these roads. New

road construction for the gob vent borehole portion of the proposal, and within the new lease modification area, is entirely outside the LAU. Approximately 2.8 acres of the new lease modification area is within the LAU. Effects to that landscape are anticipated to be limited to subsidence from underground mining activities. Surface activity within the LAU is restricted to approximately 0.5 miles of road construction to access the Iron Point exploration pad (and possible future gob vent borehole location). All of this construction is through Gambel oak stands, which are not suitable habitat. Assuming a 25' road clearing width, this is approximately 1.5 acres of oak habitat lost within the road prism. This road prism will be reclaimed after the project is completed and is expected to revert back to oak via grass/forb in the long term, resulting in no long-term habitat change. Much of the road for the potential methane drainage well locations on the north side of Terror Reservoir is on an existing road prism, which has been re-contoured and reseeded to grass at this time, and no suitable habitat alteration within the LAU will occur as a result of its reconstruction. All other surface disturbance and habitat alteration will occur outside of the LAU and not within linkage areas or travel corridors to other suitable habitats. None of the actions described above will impact lynx.

#### **3.16.1c Canada Lynx Cumulative Effects**

As there are no measurable direct or indirect effects to lynx or suitable lynx habitat as a result of this project, it does not contribute to cumulative effects on lynx.

#### **3.16.1d Canada Lynx Determination**

Implementation of the project **will have no effect on** the lynx. Any potential effects are insignificant and discountable due to the distance of the project from suitable denning habitat, the lack of suitable habitat alteration, and the low probability of loss of lynx from traffic or shooting as a result of this project

#### **3.16.2a Endangered Fish (Big River) Affected Environment**

There are four federally listed fish species which may be impacted as a result of this project (Table 3.16). These four fish species occur in warm water habitats downstream of the project area in the Gunnison and Colorado River drainages. None of the fish are known or expected to occur in the project area. However, water depletions associated with this type of project are known to impact these fish species.

#### **3.16.2b Endangered Fish Environmental Consequences**

A total water depletion of approximately 1.7 acre-feet is anticipated for these projects. Foreseeable development of the new lease area and the three likely gob vent boreholes associated with that area would increase the water depletion to approximately 2.0 acre feet. The potential effects to these fish are limited to water depletions reducing habitat quantity and quality downstream from the project area. These fish do not occur in the immediate vicinity of the project.

#### **3.16.2c Endangered Fish Cumulative Effects**

Cumulative effects for the Endangered Species Act include future non-federal actions which may impact this species. Past actions are included in the existing conditions described in this report.

Grazing in this area may contribute to vegetation changes on private lands in the area. However, those lands are already modified through long term human use, and continued grazing is not likely to alter the suitability of lynx habitat in this area from current conditions. Water developments already exist on the landscape, and future actions will continue use and maintenance of existing facilities. Private land mining to the south of the project area has resulted in some surface disturbance, subsidence, and water depletion.

Federal actions in this area include ongoing grazing, other minerals projects including a ventilation shaft near the bottom of Hubbard Creek, monitoring wells near the bottom of Hubbard Creek, ongoing exploration in the Spruce Stomp area, and the Terror Creek Applied Silvicultural Assessment, which is being analyzed separately at this time.

For these fish species, the cumulative impact area must include all of the drainage downstream of the location of the fish, which therefore encompasses a large portion of western Colorado. By definition, water depletions represent an adverse impact to these fish species and their designated critical habitat. Although the depletion for this specific project is relatively small, it contributes to significant water depletion and habitat loss downstream where the listed species occur.

### **3.16.2d Endangered Fish Determination**

Water depletion associated with this project is consistent with the programmatic document developed for small water depletions (< 100 acre-feet per year) associated with numerous mineral development projects located on the GMUG NF (USFWS May 25, 2005, amended April 27, 2007 - #ES/GJ-

6\_CO-99-F-033-CP062). Therefore, the GMUG will not request a Biological Opinion, and instead follow the terms of the agreement by reporting the end of January each year the amount of water used in the preceding year.

Implementation of the project **may affect, and is likely to adversely affect**, the bonytail, Colorado pikeminnow, the humpback chub, and the razorback sucker, due to the cumulative nature of water depletions associated with this project. This project **may affect, and is likely to adversely affect**, designated critical habitat for these species downstream of this project.

### **3.16.3a Greenback Cutthroat Trout Affected Environment**

This section of Hubbard Creek is characterized as a cool-water fisheries, indicating that this reach is a transition zone between warm water dependent fisheries such as dace, chub, and sucker species, and cold water dependent species like rainbow, brown, and brook trout. Fish sampling of Hubbard Creek has revealed that the stream is composed of rainbow and brook trout, bluehead and white sucker, and speckled dace. Rainbow trout and speckled dace were the most abundant species observed. .

Greenback cutthroat trout have also been collected from headwater reaches of Hubbard Creek but have not been collected in the reach potentially affected by subsidence. Greenback cutthroat trout is a federally listed threatened species.

Additional populations may exist in East and West Forks of Terror Creek. This has not been verified by genetic data, but is suggested as possible based on 100 year old fish stocking records maintained by Colorado DOW.

### **3.16.3b Greenback Cutthroat Trout Environmental Consequences**

The type of subsidence occurs when the overburden sags downward due to collapse of mine pillars. The resultant surface effect is a large, shallow yet broad depression that is usually elliptical or circular in shape. Changes in ground slope and creation of tension cracks, particularly near the edge of the trough can occur.

Changes in ground slope and creation of tension cracks can alter surface hydrology and soil erosion processes. Increased surface erosion, debris flows and disruption of drainage pattern and flow in streams have been documented (Sidle, et al. 2000). Effects to stream channels with potential to affect this species include:

- increase in lengths of cascades and to a lesser extent glides;
- increases in pool length, numbers and volumes;
- increase in median particle diameter of bed sediment in pools; and
- some constriction in channel geometry. The magnitude of these effects varies depending upon the amount and location of subsidence. Subsidence has also been documented to affect the amount and quantity of ground and surface water (Sidle, et al. 2000).

Subsidence of 6.0-8.5 feet in Sheep Corral Gulch and Dove Gulch could increase hillslopes and alter drainage pattern thereby increasing the amount of fine and coarse sediment transported downstream into Hubbard Creek. Increased sediment delivery will also affect MIS in Hubbard Creek (e.g. rainbow, brook and brown trout's) and

bluehead sucker. This section of Hubbard Creek already receives large amounts of sediment from the erosive soils in the vicinity during normal precipitation and runoff (D. Garrison, pers. obs.) so effects of increased sedimentation may not be quantifiable beyond baseline levels.

Subsidence is also predicted to occur within 1000 feet, and in some areas less than 600 feet of Hubbard Creek. Increased surface erosion, changes to stream morphology and possible disruption of streamflows could occur as a result. Direct and indirect effects to aquatic MIS and bluehead sucker could include reduced habitat quantity and quality from sedimentation, changes in instream habitat from channel constriction or changes in stream slope. Disruption of stream flow is also a possibility, but since subsidence is not expected in the vicinity of the floodplain or stream channel there is a low probability of occurrence. Again, since this portion of Hubbard Creek already receives large amount of sediment, quantification of additional effects from sedimentation beyond baseline is difficult. The magnitude and duration of predicted effects depends upon the amount and location of subsidence.

### **3.16.3c Greenback Cutthroat Trout Cumulative Effects**

The cumulative effects area is upper and middle Hubbard Creek 6<sup>th</sup> level HUCs. Total acres in these HUCs are approximately 30,000 acres. A description of cumulative actions occurring in these watershed is available in the original BA and BE for this project. Subsidence of the ground surface with potential disruption of surface erosional process, channel changes and potential disruption of

streamflows would cumulatively add to affects in these watersheds. Reduction in habitat quality and quantity are expected by may not be quantifiable beyond baseline conditions.

### **3.16.3d Greenback Cutthroat Trout Determination**

Implementation of the proposed action with associated subsidence will result in a **“may impact individuals or habitat, but will not likely contribute to a trend towards federal listing”** determination for the bluehead sucker. Greenback cutthroat trout have not been collected in the project area but have been documented upstream in upper Hubbard Creek, the proposed action and associated subsidence will have **“no effect”**.

### **3.16.4 Conditions of Surface Use**

To reduce potential effect's to Hubbard Creek and the fishery it supports a **1/8 mile “no subsidence zone”**. This zone will reduce the probability of increase sedimentation, changes to stream channel morphology and disruption of flows. This stipulation already exists in the parent lease.

### **3.16.5 Consistency with Forest Plan and Other Regulations**

The NFMA and the ESA require the Forest Service to manage wildlife habitat to maintain viable populations of native and desirable nonnative wildlife species and conservation of listed threatened or endangered species populations (36 CFR 219.19). Additional guidance is found in FSM direction which states: *Identify and prescribe measures to prevent adverse modifications or destruction of critical habitat and other habitats essential for the conservation of endangered, threatened, and proposed species* (FSM 2670.31[6]). The ESA requires the

Forest Service to manage for recovery of threatened, endangered, and proposed (TEP) species and the ecosystems upon which they depend. A Biological Assessment has been completed and assesses the impacts of the proposed action on threatened and endangered species.

Consultation with the FWS is not required due to the no effects determinations and biological opinions.

## **3.17 Sensitive and Management Indicator Species Wildlife & Aquatic Species**

### **3.17.1 Sensitive and Management Indicator Wildlife & Aquatic Species General Affected Environment**

#### **Methodology**

Portions of the area have been surveyed previously for other projects, primarily coal exploration (USDA 2001, Monarch and Ward 2005). Aerial photographs, field visits, vegetation typing, and results of those surveys were used to determine preliminary species which may be impacted by the project, as well as species which may have needed further examination. Reviews were conducted to determine which species are known from the area or have suitable habitat present and could potentially occur. Primary sources included district wildlife sightings records and information from species assessments prepared for Sensitive Species in Region 2 (USDA 2008b). No substantive wildlife field work has yet been conducted for this specific project, as a project proposal was not developed in time for the 2007 field season. Surveys for some species will be conducted subsequent to this analysis but prior to

implementation, and if actual results of those surveys differ substantially from predicted values, additional analysis may be required, or specific design criteria or mitigations may need to be implemented to protect species.

The analysis area used for direct, indirect, and cumulative effects is a 6885-acre area comprising the footprint of the three projects and a one mile buffer.

HABCAP modeling was used for this analysis. It was developed as a comparative tool to model differences in habitat capabilities between alternatives by calculating changes in habitat types and structural stages. A Habitat Capability Index (HCI) for each species is determined from the relative amounts of particular habitat types within the analysis area, based on the species' uses of that habitat for various functions and at various times of the year. Other factors, such as road density, are included for some species such as elk. It estimates capability at a single point in time, and does not simulate change over time. Long-term changes in habitat are addressed in the discussion within this document. In addition, HABCAP models were run for the analysis area and species with a habitat capability index (HCI) of less than 0.05 (Pine marten, Lewis' woodpecker, and northern 3-toed woodpecker) were not carried forward for analysis.

Timeframes used for the HABCAP analysis include effects of increased traffic, human activity, equipment use, and habitat changes over the short-term. Further information on assumptions in HABCAP modeling are discussed below.

## **Existing Condition**

R2Veg GIS data as of 07 March 2008 was used in this analysis to describe existing vegetation and habitats within the project area. Due to the extent of aspen decline in the area, a large portion of the landscape in the vicinity of Terror Reservoir was updated in R2Veg over the course of the winter in 2007/2008. It is anticipated that additional aspen will decline in 2008 and beyond, and that the affected aspen stands may constitute a much larger portion of the analysis area than they do as of the date of this Assessment. The analysis area for the Biological Assessment is the geographic footprint of the three projects, including all new ground disturbance but excluding previously disturbed sites (existing roads or previous pad access and pad locations), buffered by one mile. Other scales of analysis may be used for other species, as noted in the Biological Evaluation for these projects. Existing vegetation at the analysis scale (project footprint with a 1 mile buffer), is shown in Table 2. This value was determined to include sufficient habitat to encompass all impacts to species which may occur in the vicinity of the project. Data outside the external boundaries of the Forest is possibly less accurate in this area, but due to the proximity of the project to the Forest boundary, it was decided that exclusion of the area outside of the Forest for analysis purposes would be inappropriate in this case. There are small portions of the analysis area for which no vegetation data is available, however, and was not used for calculations for this project. Figure 1 shows the project footprint and existing vegetation within the analysis area.

**Table 3.17.1. Bowie Multiple Projects Existing Vegetation Data**

| Vegetation Type (R2Veg Cover Type) | Action Area (project footprint with 1 mile buffer) acreage | Sum of vegetation alteration from project components and structural stage altered |
|------------------------------------|--|---|
| Forbs                              | 7.54   | 0   |
| Grass                              | 32.21  | 0   |
| Bare ground                        | 65.50  | 0   |
| Gambel oak (shrub)                 | 4647.21  | 15.2 (shrub)  |
| Mountain shrub                     | 3.10   | 0   |
| Aspen                              | 1265.48  | 0.95 (Sapling/pole cover 40-70%)  |
| Cottonwood                         | 46.16  | 0   |
| Douglas fir                        | 105.70   | 0   |
| Pinyon-Juniper                     | 55.39  | 0.8 (Sapling/pole cover <40%)   |
| Spruce-fir                         | 626.18   | 1.9 (Sapling/pole cover 40-70%)   |
| Water                              | 30.09  | 0   |
| Total Known, used for analysis     | 6884.56  | 18.85   |
| Unknown*                           | 383.59   | 0   |
| Total Area                         | 7268.15  | 18.85   |

\*A portion of the analysis area is outside of existing R2VEG information, and is not used in the calculations for this project.

Habitats in the project vicinity are dominated by Gambel oak (*Quercus gambelii*) and associated vegetation, followed by pockets of aspen and spruce-fir forest. Areas proposed for road locations and well pad sites are predominately oak vegetation types, with one pad site in pinyon-juniper, one bordering spruce-fir and oak, and in the proposed development for the lease modification area, one new site in aspen.

The project area is at 6400 to 8100 feet of elevation.

**Assumptions**

For this analysis, all project design standards and mitigation measures described in the proposed actions above were considered. While few if any of these are wildlife-specific, they may result in changes to timing or other alterations to project activities which may impact wildlife species. In addition, the reasonably foreseeable development for the lease modification area is assumed to be as indicated on the maps. As pad sites are largely restricted



by topography in this area, the locations are thought to be accurate

### **3.17.2 Sensitive and Management Indicator Species Wildlife & Aquatic Species Environmental Consequences**

#### **3.17.2a Changes in Vegetation and Habitat**

##### **3.17.2b No Action**

No direct human-caused change in existing condition of current vegetation and habitat is anticipated if no action is undertaken for this project. Other projects in the surrounding areas, however, will likely occur and may have impacts to vegetation and habitats within the project area. Condition trends will continue as they currently exist modified as per other actions occurring on the landscape. Continued aspen decline is expected to occur and may have substantial impacts to the quantity and health of aspen stands within the LAU and surrounding areas in a short (under ten years) time frame. In addition to the aspen decline, succession of conifers within aspen stands would be expected to continue. This succession and change of habitat suitability would take place over many decades.

##### **3.17.2c Proposed Action**

Table 3.14 shows individual components of the proposed actions and affected vegetation resulting from those actions. Road clearing width is assumed to be 25' for consistency, and pad widths are as noted in the proposed action. Some elements of the proposed action already exist, or are duplicated in portions of the proposals, and those are taken into consideration in the values below. If the proposed action is implemented, habitat changes within the project area would occur as noted in Table 6. In the short

term, this habitat would be converted into roads and drill pads, which are effectively bare ground and because of occupancy by humans, not suitable habitat for any of the species listed above. After project completion, rehabilitation of the landscape is expected to result in the impacted areas growing back to grasses and then to some type of mountain shrub habitat. In this area, shrub stands are typically dominated by Gambel oak, so that type (SGO) was used as a final habitat condition for the analyses.

##### **3.17.2d Cumulative Effects**

Actions which have occurred in this area previously are primarily related to coal exploration, and have accounted for the current road system within the area. The FACTS database shows one vegetation project within the analysis area, a 479-acre prescribed burn in 1979. Vegetation in this area has largely regrown and effects of this fire are no longer noticeable on the landscape in most areas. The Terror Creek Applied Silvicultural Assessment Project (currently being analyzed separately) includes one unit partially within the analysis area for this project. For HABCAP modeling, an assumption that the unit would be treated and regrow to mountain shrub was used for analysis as noted in individual species discussions below, where relevant. The WAPA power line borders the western edge of the analysis area, and future actions related to its maintenance and protection may occur within the analysis area for this project.

Other federal actions which have occurred in the past and are expected to occur in the future include permitted livestock (currently cattle) grazing and permitted outfitter/guided hunting. Road and trail maintenance is expected to

continue within the area at a minimal level, except that done by the coal companies to access their facilities. Non-federal actions occurring in the area within the last ten years include recreational hunting, ATV, motorcycle, and mountain bike riding on existing roads and trails, dispersed camping (5 known sites, primarily associated with

hunting), and nonspecific dispersed recreation. Water development (reservoirs, ditches) occurs on federal lands in the area, specifically the Terror Ditch, which drains portions of the Hubbard Creek drainage to the north, and Terror Reservoir.

**Table 3.17.2. Vegetative Impacts of Cumulative Effect Components**

| Action  | Vegetation Type                         | Acres Impacted |
|---|---|----------------|
| Gob Vent Borehole Road Construction (3.3 miles)   | Gambel oak (shrub)                      | 9.2            |
|   | Pinyon-Juniper sapling/pole, cover <40% | 0.1            |
|   | Spruce-fir sapling/pole, cover 40-70%   | 0.7            |
| Gob Vent Borehole Pad Construction (N=7)*   | Gambel oak (shrub)                      | 3.5            |
|   | Pinyon-Juniper sapling/pole, cover <40% | 0.7            |
|   | Spruce-fir sapling/pole, cover 40-70%   | 0.7            |
| Lease Modification Foreseeable Road Construction (Estimated values for new disturbance**) | Gambel oak (shrub)                      | 0.5            |
|   | Spruce-fir sapling/pole, cover 40-70%   | 0.5            |
|   | Aspen sapling/pole, cover 40-70%        | 0.25           |
| Lease Modification Foreseeable pad construction (Estimated values for new disturbance***) | Aspen sapling/pole, cover 40-70%        | 0.7            |
| Jeep Trail Exploration Road Construction  | Gambel oak (shrub)                      | 2.0            |
| Total Habitat Modification  |   | 18.85          |

\* Two pads already exist.

\*\* A portion of the road location has been previously built and rehabilitated.

\*\*\* One pad location has been previously built and rehabilitated.

**3.17.2e Conditions of Surface Use**

There are several conditions of surface use that will need to be incorporated into projects in order to meet Forest Standards and Guidelines and other

guidelines to protect wildlife species. These are shown in Table 5. Other design features that would benefit wildlife, but are based on other needs, are not listed here, but are included in the effects analysis for affected species.

**Table 3.17.2e. Conditions of surface use for wildlife.**

| Location   | Condition   |
|--|---|
| Project-wide   | Surveys for raptors shall be conducted prior to timber harvest operations to determine locations of individuals or populations of these species and allow for the implementation of design criteria as appropriate.<br><br>This applies specifically to goshawks, peregrine falcons, and golden eagles but may apply to other species if located during surveys. In parent lease. |
| Project-wide   | No activities shall be allowed within ¼ mile of an active northern goshawk nest from March 1 to July 31 if they would cause nesting failure or abandonment (LRMP III-26). In parent lease for general raptor conditions February 1 to August 15.  |
| Project-wide   | No activities shall be allowed within ¼ mile of an active flammulated owl nest from March 1 to July 31. In parent lease for general raptor conditions February 1 to August 15.  |
| As needed  | No activities shall be allowed within one mile of an active bald eagle or peregrine falcon nest from February 1 to July 31 if they would cause nesting failure or abandonment. (LRMP III-33). Parent lease has 1/2 mile buffer, bald eagle timing restriction November 15 to July 30, golden eagle from February 1 to July 15.  |
| Not applicable as proposed, may be needed if proposal changes in future. | No surface occupancy beyond historic levels within ¼ mile radius of active golden eagle nests. (CDOW 2008) Not in parent lease.   |
| As needed  | Seasonal restriction to human encroachment within ½ mile radius of active golden eagle nests from December 15 through July 15. (CDOW 2008) Parent lease has seasonal restriction of ¼ mile from February 1 to July 15.  |

**3.17.2f Consistency with Forest Plan and Other Regulations**

The FSM directs the Regional Forester to identify sensitive species for each National Forest where species viability may be a concern. National Forests are then required to monitor sensitive species populations and prevent declines that could require listing under ESA (FSM 2670.32 (4)). The direction

requires the Forest Service to manage the habitat of the species listed in the Regional Sensitive Species List to prevent further declines in populations, which could lead to Federal listing under the ESA.

The alternatives discussed in this EA would not result in a decline or reduction of viability of the populations of

sensitive species identified to occur on the GMUG National Forests. A Biological Evaluation has been completed to assess the impacts of the alternatives on sensitive species. The Biological Evaluation is located in the project file.

Proposed Action is consistent with the Forest Plan, NFMA, ESA, RPA, Executive Order 13186, the Bald and Golden Eagle Protection Act, Forest Service Manual (FSM) and Handbook (FSH) direction. All alternatives are consistent with the recent Management Indicator Species Amendment, Forest Plan Amendment 2005-01. This amendment was approved in May 2005. The amendment revises language in Forest Direction and Standards and guidelines for Management Areas, and the Monitoring Plan (see pages A-1 through A-17 of Management Indicator Species Forest Plan Amendment EA, Appendix A).

### **3.18 Sensitive Species**

There are several sensitive species that are or are potentially present in the project area. Information on distribution, dispersal capability, abundance, population trends, habitat trends, habitat vulnerability, and risks based on life history and demographics has been reviewed for USFS R2 Sensitive Species, and is available on Region 2's website ([www.fs.fed.us/r2/projects/scp](http://www.fs.fed.us/r2/projects/scp)). This information has been incorporated where relevant. The list of species reviewed for this project was taken from the Region 2 Sensitive Species Matrix (USDA 2008). This excluded R2 Sensitive Species which were not known or expected to occur on the GMUG. A list of all possible sensitive species on the Forest is given in Appendix 1. Numerous species which may occur on

the GMUG NF, but are not known or expected to occur in the project area, due to absence of habitats or range limitations, were not carried forward for analysis. None of the plant species on the Sensitive Species list are known or expected to occur in this area and were not analyzed in detail for this project. Species are presented here in the order they are listed in the matrix.

#### **3.18.1 Sensitive Species Environmental Consequences No Action (common to all species)**

The direct and indirect impacts of the "no action" alternative would not change current habitat or population conditions of any Forest Service sensitive or management indicator species in the short term. Long-term changes would continue to be dependent on existing conditions, current succession of vegetative types, and other actions within the project area. Based on present knowledge of the aspen decline, this may result in both short- and long-term loss of aspen at a landscape scale in this area.

#### **3.18.2a Fringed myotis, spotted bat, Townsend's Big-eared bat Affected Environment**

Fringed myotis, spotted bats, and Townsend's big-eared bats may utilize areas in the Hubbard Creek canyon, and in the vicinity of the project area, for roosting or hibernating. Foraging is likely more common along the immediate creek bottom than in the oak shrub habitats at the immediate project site. There are large rocky bluffs and large areas of fractured rock in the area. There are no known roosts or hibernacula in the area, although survey work to date has been limited. There are no known records of these species on the Paonia Ranger District or in the

immediate vicinity of the project. One mist net survey (two visits) has been conducted along Hubbard Creek near the Forest boundary south of the project site. No sensitive bat species were captured during the survey. Future bat surveys (mist netting) are planned for the Hubbard Creek drainage in the summer of 2008. If survey results indicate the need for further analysis, it will occur. Survey results will be added to the project file as surveys occur.

**3.18.2b Fringed myotis, spotted bat, Townsend's Big-eared bat Environmental Consequences Proposed Action**

Actions with the potential for effects to this species include:

- Short-term effects of disturbance during road and pad construction.

Human-caused disturbance to roosting sites or hibernacula may result from equipment use in this area. The significant quantity of cliffs and broken rock outcrops in the area provide substantial potential habitat for these species, and disturbance effects are not well known for these three species.

Surveys are planned for 2008 and beyond at the previously surveyed point near the Forest boundary in Hubbard Canyon. If any of the above species are located during surveys, it is likely that they are using the area upstream of the survey point, and possibly rock features in the project area, for roosting, and further evaluation of the impacts of the project may be needed.

No loss of habitat is anticipated as a result of this project. Foraging potential will not change as a result of this project, as no riparian areas are to be impacted and bats can forage in a wide variety of locations, including the clearings provided by roads or pads.

**3.18.2c Fringed myotis, spotted bat, Townsend's Big-eared bat Cumulative Effects**

The cumulative effects analysis area for this species is the 6885-acre area surrounding the proposed treatments and activities. None of the current or proposed future projects are anticipated to result in loss of roosting or foraging habitat for this species, and disturbance from other projects is likely to be similar to that from this and previous projects in the area. This project is not anticipated to contribute to significant cumulative effects for these species.

**3.18.2d Fringed myotis, spotted bat, Townsend's Big-eared bat Determination**

Implementation of the proposed action "may impact individuals or habitat, but will not likely contribute to a trend towards federal listing". This is based on the presence of suitable roosting and hibernating locations in or near the project area, and the unknown effects of disturbance in this area. As similar sites exist throughout the Hubbard Canyon and North Fork Valley, and none of these species are known to use this area, the potential for harmful effects at the population level is anticipated to be low.

**3.18.3a Northern goshawk Affected Environment**

This species occurs on the GMUG. Nesting seems to occur in mature forest types (spruce-fir, lodgepole pine, and aspen). Foraging habitat may include younger or more open canopy forests. The goshawk may be vulnerable to nest abandonment due to disturbance within the area. Alternate nests are commonly used, but nest tree fidelity was stronger in uncut forests compared to treated forests (USDA 2005a).

**Table 3.18.3a. Potentially suitable goshawk habitat on the GMUG NF by vegetation cover type and habitat structural stage.**

| Cover Type                            | 1    | 2      | 3A     | 3B     | 3C     | 4A     | 4B     | 4C/5   | Total   |
|---------------------------------------|------|--------|--------|--------|--------|--------|--------|--------|---------|
| Aspen                                 | 0    | 4743   | 55301  | 211399 | 41446  | 23567  | 227148 | 176278 | 739881  |
| Cottonwood Riparian                   | 0    | 0      | 248    | 100    | 0      | 2530   | 1532   | 42     | 4452    |
| Gambel oak                            | 0    | 291383 | 472    | 82     | 0      | 416    | 0      | 0      | 292353  |
| Mountain shrub                        | 0    | 165073 | 0      | 0      | 0      | 0      | 0      | 0      | 165073  |
| Sagebrush                             | 0    | 101838 | 0      | 0      | 0      | 0      | 0      | 0      | 101838  |
| Wet meadow                            | 4573 | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 4573    |
| High elevation riparian (blue spruce) | 0    | 0      | 101    | 242    | 560    | 234    | 597    | 836    | 2570    |
| Douglas fir                           | 0    | 0      | 3396   | 8226   | 2416   | 8848   | 16192  | 6590   | 45668   |
| Lodgepole pine                        | 0    | 758    | 7100   | 124674 | 54741  | 4658   | 49472  | 38887  | 280290  |
| Pinyon-juniper                        | 0    | 0      | 28542  | 37131  | 625    | 29956  | 39064  | 1554   | 136862  |
| Ponderosa pine                        | 0    | 251    | 10530  | 13060  | 94     | 42180  | 44102  | 965    | 111182  |
| Spruce-fir                            | 0    | 269    | 38910  | 99888  | 11933  | 72923  | 322729 | 201388 | 748040  |
| Total acres                           | 4573 | 564315 | 144600 | 494792 | 111815 | 185312 | 700836 | 426540 | 2632782 |

Potentially suitable habitat derived from HABCAP modeling based on Hoover and Wills, 1984.

There are numerous documented sightings of this species on the District, as well as one known historic nest location within the cumulative effects area. Based on actual known locations of nest sites, suspected breeding territories, and sightings, the northern goshawk appears to be well distributed throughout the GMUG in suitable habitat. Records of known goshawk nest activity on the GMUG show that numbers of breeding goshawks and nest success has remained

relatively stable, although low over a 17-year period (USDA 2001). Breeding Bird Survey data show a slight increasing trend for this species in Colorado from 1980-2006 (Sauer et al. 2007).

The primary threat to goshawk populations is alteration of its preferred habitat from timber management practices. Although the goshawk uses a wide range of forest communities during the breeding season, it prefers mature

and old growth forest for nesting and hunting. Although there is some evidence goshawks are resilient of forest fragmentation and can re-establish when cleared areas are reforested, the thresholds for population persistence have not been identified. Issues related to habitat alteration include forest fragmentation, creation of even-aged, monotypic stands, potential increase in area of younger age class, and loss of tree species diversity (Kennedy 2003).

The nearest known goshawk territory to the project is near the Hubbard 2 Timber Sale, in sections 6 and 7, T12S, R91W. The goshawks in this territory were monitored from 1993 to 2003, and the last documented nesting was in 1997 (District files). Monitoring of this territory is planned for 2008. The mapped locations of goshawks from this territory are approximately 6000 meters (3.8 miles) from the nearest potential treatment area for this project. There are no known territories in or immediately adjacent to the proposed treatments. General raptor surveys were conducted in the majority of the project area in 2005 for another project (Monarch and Ward 2005), and no goshawk nests were located in this area. However, surveys should be conducted by the proponent prior to initiation of activities in or near aspen, and if goshawks are located in this area, the project will need to be implemented in accordance with design criteria noted in the proposed action, which comply with the standards and guidelines from the Forest Plan.

**3.18.3b Northern goshawk  
Environmental Consequences  
Proposed Action**

Actions with the potential for effects to this species include:

- short-term effects of disturbance during road and pad construction

- short-term potential for loss of young during construction
- long-term changes to habitat

Human disturbances to goshawk nests have been a suspected cause of nest abandonment (Reynolds et al. 1992). Alternate nests are used commonly, but Crocker-Bedford found yearly nest tree fidelity remained at 67% in uncut forests, while treated units dropped to 15-20%, even with no-cut buffers around the nests (USDA 2005a).

Braun et al. (1996) reviewed existing goshawk management guidelines. They found no studies of human disturbance on breeding goshawks, but felt that the recommendation to minimize human activities in the nest area during the breeding season was a reasonable, conservative approach.

The nearest know nest territory is several miles from the proposed activities. Activities associated with this project would have no effect on known territories, if they were occupied.

Project conditions include completing raptor surveys prior to harvest and avoiding activities near occupied nests. This design feature would help reduce the potential for loss of young during nesting as a result of nest abandonment due to disturbance.

Implementation of the project will result in the loss of less than one acre of mature aspen habitats, which are currently suitable for goshawk foraging and nesting, if currently unoccupied. HABCAP modeling was used to determine the impacts of this habitat alteration within the cumulative effects area. The existing HCI for this area is 0.13 for goshawk summer habitat and 0.16 for goshawk winter habitat, limited primarily by the extent of aspen in the area. Modeling of the implementation of

this projects results in no change at this level of precision to the HCI values for this species, either in the short term or the long term.

### **3.18.3c Northern goshawk Cumulative Effects**

The cumulative effects analysis area for this species is the 6885-acre area surrounding the proposed treatments and activities. HABCAP modeling assuming complete replacement of aspen within the Terror Creek Applied Silvicultural Assessment in the analysis area (24.10 acres of TAA 4C) with mountain shrub will slightly lower the HCI of summer habitat in this analysis area to 0.12. While the HCI values for the analysis area seem to indicate that the area in general is not currently high quality habitat, the aspen component of the area has been only slightly impacted by man, and immediate changes to habitat quality at the landscape scale will be a result of the aspen decline and not direct harvest activities. Maintenance of the area for management indicator species such as the goshawk is continuing at or above desired levels

The GMUG did an analysis of habitat trends on the Forest; aspen have stayed the same in the 1983 to 2000 period (USDA Forest Service 2005c). A current trend for aspen has not been done at the forest level. However, approximately 5000 acres of aspen is in decline in the Terror Creek Applied Silvicultural Assessment area, and 13% of the aspen state-wide has declined since 2005. On the Paonia District, flights in 2007 showed aspen decline on 20,733 acres of 297,938 surveyed (Region 2 Forest Health GIS data). Of the area flown, approximately 122,000 acres was in aspen type (R2Veg, October 2007), thus approximately 17% of the aspen on the flown portion of the

district is in decline. The cumulative effects area currently contains 1265 acres of aspen.

The closest portion of the project is 3.8 miles from the nearest known goshawk nesting territory, and should not contribute cumulative effects to this territory.

### **3.18.3d Northern goshawk Determination**

Implementation of the proposed action “may impact individuals or habitat, but will not likely contribute to a trend towards federal listing”. This is based on the small amount of habitat affected, and conditions for surface use for conducting pre-disturbance surveys and buffering known nest locations. The negative effects from this project are of short duration and magnitude and do not result in a substantial Forest-wide decrease in trends, or deter from meeting the MIS objectives in the Forest Plans.

### **3.18.4a American Peregrine Falcon Affected Environment**

This species was delisted by the USFWS in August 1999 and is considered recovered from endangered status in many areas. Current data from monitoring projects in R2 states suggest that this species distribution is very patchy and that it is absent from some areas resulting in large gaps in its distribution. (USDA 2005a) The peregrine falcon is rare in Colorado, and no known nest locations occur on the Paonia district. However, suitable nesting habitat in the form of cliffs occurs in the Hubbard Canyon near the project area. Surveys for another project (Monarch and Ward 2005) did not locate peregrines in the canyon, but it is possible that they occur in the area.



**3.18.4b American peregrine falcon  
Environmental Consequences  
Proposed Action**

Actions with the potential for effects to this species include:

- short-term effects of disturbance during road and pad construction

Human-caused disturbance to nesting sites may result from equipment use in this area. The significant quantity of cliffs and broken rock outcrops in the area provide substantial potential habitat for these species, and disturbance may occur if unknown sites exist near project locations.

Pre-disturbance surveys will be conducted prior to activities which could lead to loss of nests through disturbance, and if nests are located, conditions for surface use will be triggered.

No loss of habitat is anticipated as a result of this project. Foraging potential will not change as a result of this project.

**3.18.4c American peregrine falcon  
Cumulative Effects**

The cumulative effects analysis area for this species is the 6885-acre area surrounding the proposed treatments and activities. None of the current or proposed future projects are anticipated to result in loss of nesting or foraging habitat for this species, and disturbance from other projects is likely to be similar to that from this and previous projects in the area. This project is not anticipated to contribute to significant cumulative effects for these species.

**3.18.4d American peregrine falcon  
Determination**

Implementation of the proposed action “may impact individuals or habitat, but will not likely contribute to a trend

towards federal listing”. This is based on the presence of potential nest locations in or near the project area, and the low potential for disturbance as a result of pre-disturbance surveys and implementation of conditions for surface use if needed. As similar sites exist throughout the Hubbard Canyon and North Fork Valley, and this species is not known to use this area, the potential for harmful effects at the population level is anticipated to be low.

**3.18.5a Flammulated owl Affected  
Environment**

This species is known to occur on the Forest. Flammulated owls have a strong association with ponderosa pine, but also use aspen forests in the montane life zone. This species is migratory, but shows high site tenacity by adults. As an insectivore, they can occur at relatively high densities compared to other owls (Hayward and Verner 1994, USDA 2005). These owls depend on cavities for nesting, open forests for catching insects, and brush or dense foliage for roosting (Kingery 1998).

No surveys were done specifically for flammulated owls for this project. Flammulated owls are documented on other portions of the GMUG NF, utilizing nest boxes (NRIS FAUNA database). No Breeding Bird Survey information is available for this species. No surveys are planned due to the small area of aspen to be impacted by this project. However, if during other activities, flammulated owls are located in this area, the project will be implemented in accordance with the standards and guidelines from the Forest Plan.

**3.18.5b Flammulated owl  
Environmental Consequences  
Proposed Action**

Actions with the potential for effects to this species include:

- short-term effects of disturbance during harvest
- short-term potential for loss of young during harvest
- long-term changes to habitat

These owls are very tolerant of humans, nesting close to occupied areas and tolerating observation by flashlight at night. The effects of mechanical disturbance have not been assessed, but moderate disturbance may not have an adverse impact on the species (Hayward and Verner 1994).

The territory occupancy begins in late April or early May, with fledging in mid to late July (Hayward and Verner 1994). Project design features include surveying suitable habitat, and harvest activities would be prohibited within 0.25 miles of an active nest until July 31<sup>st</sup>. This design feature would help reduce the potential for loss of young during nesting as a result of project activities.

Implementation of the proposed action would result in the loss of less than one acre of suitable nesting and foraging habitat for this species (mature aspen). This represents less than 0.1% of the suitable habitat for this species in the analysis area, and is unlikely to impact this species in this area.

**3.18.5c Flammulated owl Cumulative Effects**

The cumulative effects analysis area for this species is the 6885-acre area surrounding the proposed treatments and activities. Loss of aspen from the Terror Creek Applied Silvicultural Assessment

Project would reduce the amount of habitat in the analysis area by another 24.1 acres, thus a cumulative loss of 25 acres of habitat (2.0% of available) in the analysis area. None of the ongoing or reasonably foreseeable activities within this area, when combined with the proposed action, are likely to contribute to long-term cumulative impacts to this species.

See the goshawk analysis above concerning trends in aspen on the Forest.

**3.18.5d Flammulated owl  
Determination**

Implementation of the proposed action “may impact individuals or habitat, but will not likely contribute to a trend towards federal listing”. This is due to the loss of less than 1 acre of habitat as a result of this project and the total loss of 25 acres of habitat if all future projects in the analysis area are carried out.

**3.18.6a Olive-sided flycatcher Affected Environment**

This species is known to occur on the Forest. They primarily breed in spruce/fir forest, but use the forest-opening ecotone and are a colonizer of post-disturbance habitats. Openings, conifers, snags and an abundant insect food source are the crucial elements (USDA 2005a). They occur less regularly and less abundantly in deciduous or mixed aspen/conifer forests (Kingery 1998). Olive-sided flycatchers have been seen throughout the district and may occur in the project area. This species shows a relatively stable trend in Colorado (Sauer et al. 2007). Olive-sided flycatchers are occasionally seen on the district, in a variety of habitats, usually near water or large openings while foraging (D Garrison, pers. obs.).

**3.18.6b Olive-sided flycatcher  
Environmental Consequences  
Proposed Action**

Actions with the potential for effects to this species include:

- short-term effects of disturbance during construction and operations
- short-term potential for loss of young during construction
- long-term changes to habitat

The nest-building through fledging period runs from about June 5 through August 2 for this species (Kingery 1998).

This species is associated with spruce/fir habitats, similar to martens. Direct loss of this habitat is less than 2 acres within the analysis area (0.3%). However, the species may utilize other habitats for foraging, and may use the newly created openings of the road prisms and pads for foraging. Creation of these opening would therefore benefit this species if it occurs in the project area.

**3.18.6c Olive-sided flycatcher  
Cumulative Effects**

The cumulative effects analysis area for this species is the 6885-acre area surrounding the proposed treatments and activities. None of the ongoing or reasonably foreseeable activities within this area, when combined with the proposed action, are likely to contribute to long-term cumulative impacts to this species.

**3.18.6d Olive-sided flycatcher  
Determination**

Implementation of the proposed action “may impact individuals or habitat, but will not likely contribute to a trend towards federal listing”. This is due to

the minimal loss of suitable habitat (0.3%) as a result of this project, and the possible increase in foraging opportunities resulting from creation of the openings of road prisms and well pads.

**3.18.7a Purple martin Affected  
Environment**

This species is known to occur on the Forest and is primarily associated with patches of old growth aspen. Nest site availability may be a key limiting factor to populations in R2 (USDA 2005a). The preferred habitat of purple martins in the Rocky Mountains is mature aspen forest with nearby meadows and open water. Martins nest in cavities in live aspen trees (Wiggins 2005). This species shows an upward population trend in Colorado but is relatively stable to slightly decreasing across the US (Sauer et al. 2007). Several colonies of martins are known on the district. No surveys are planned due to the small area of aspen to be impacted by this project. However, if during other activities, martins are located in this area, the project will be implemented in accordance with the standards and guidelines from the Forest Plan.

**3.18.7b Purple martin Environmental  
Consequences Proposed Action**

Actions with the potential for effects to this species include:

- short-term effects of disturbance during construction and operation
- short-term potential for loss of young during construction
- long-term changes to habitat

The nest-building through fledging period runs from about June 6 through July 31 for this species (Kingery 1998).

This species uses aspen habitats, similar to flammulated owls. Implementation of the proposed action would result in the loss of less than one acre of suitable nesting and foraging habitat for this species (mature aspen). This represents less than 0.1% of the suitable habitat for this species in the analysis area, and is unlikely to impact this species in this area.

Regeneration discussion and assumptions are the same as for goshawk noted above.

### **3.18.7c Purple martin Cumulative Effects**

The cumulative effects analysis area for this species is the 6885-acre area surrounding the proposed treatments and activities. Loss of aspen from the Terror Creek Applied Silvicultural Assessment Project would reduce the amount of habitat in the analysis area by another 24.1 acres, thus a cumulative loss of 25 acres of habitat (2.0% of available) in the analysis area. None of the ongoing or reasonably activities within this area, when combined with the proposed action, are likely to contribute to long-term cumulative impacts to this species.

See the goshawk analysis above concerning trends in aspen on the Forest.

### **3.18.7d Purple martin Determination**

Implementation of the proposed action “may impact individuals or habitat, but will not likely contribute to a trend towards federal listing”. This is due to the loss of less than 1 acre of habitat as a result of this project and the total loss of 25 acres of habitat if all future projects in the analysis area are carried out.

### **3.18.8a Loggerhead Shrike Affected Environment**

The loggerhead shrike breeds in a wide variety of open habitats, including grasslands, sage, and shrub. It nests in bushes or trees, and uses bushes and trees for perches from which it feeds. It feeds primarily on insects and small vertebrates, and forages in open short grasses and bare ground (Wiggins 2005a). The GMUG is at the northern edge of the year-round range of this species. Breeding Bird Survey information on this species shows an upward population trend in Colorado (Sauer et al. 2005). Bird surveys in this area in the past have not detected loggerhead shrike, but habitat does exist (USDA 2001).

### **3.18.8b Loggerhead Shrike Environmental Consequences Proposed Action**

Actions with the potential for effects to this species include:

- short-term effects of disturbance during construction and operation
- short-term potential for loss of young during construction
- long-term changes to habitat

Disturbance during construction or operation activities may cause shrikes to alter habitat use patterns in the area and may result in territory shifts in the oak stands in or near the project area. Nests may be lost during construction activities, and habitat alteration as a result of construction will result in the short-term loss of 15.2 acres of habitat (0.3% of suitable habitat in the analysis area). These impacts are expected to be limited as previous survey work has not detected the species in this area, and the impacted area is small.

### **3.18.8c Loggerhead Shrike Cumulative Effects**

The cumulative effects analysis area for this species is the 6885-acre area surrounding the proposed treatments and activities. None of the current or proposed future projects are anticipated to result in further loss habitat for this species, and disturbance from other projects is likely to be similar to that from this and previous projects in the area. This project is not anticipated to contribute to significant cumulative effects for these species.

### **3.18.8d Loggerhead Shrike Determination**

Implementation of the proposed action “may impact individuals or habitat, but will not likely contribute to a trend towards federal listing”. This is based on the presence of suitable habitat in or near the project area, the possibility for disturbance or mortality during construction and operations activities, and a small habitat change in the area. As previous survey work has not resulted in any shrike detections, and substantial other habitat exists in the area, these impacts are anticipated to be minor, and the potential for harmful effects at the population level is anticipated to be low.

### **3.18.9a Boreal toad Affected Environment**

The boreal toad was petitioned for listing in 1993. In 1994, the FWS found that listing may be warranted. Boreal toads are listed as endangered by the Colorado Division of Wildlife (CDOW). The State of Colorado prepared a Recovery Plan for boreal toads in Colorado in 1994, which has been combined with other information and updated to the current Conservation Plan and Agreement (Loeffler 2001). In 2005, the FWS

announced a finding that listing was warranted but precluded by higher priority listings. Several assessments have occurred since then. In the finding, the FWS noted that a proposed listing determination for the boreal toad would be funded Fiscal Year 2005. They then evaluated new information, and reevaluated previously acquired information. They determined that the Southern Rocky Mountain population does not qualify as a distinct population segment and the boreal toad was removed from the candidate list (USDI 2005).

Boreal toads were once very common in the mountains of Colorado, but there were declines in abundance and distribution that began in early 1970s and extended into the 1990s. In Colorado, recent surveys of several hundred potential breeding sites within the historic range indicate that the toad has completely disappeared or declined to extreme rarity in most of the state (Hammerson 1999). Distribution is restricted to areas with suitable breeding habitat in aspen and spruce fir forests and alpine meadows (7000 to 12,900 ft). Breeding habitat includes lakes, marshes, ponds and bogs with sunny exposure and quiet, shallow water (Loeffler 2001). Hammerson (1999) reports that in Colorado, the boreal toad lives in damp conditions in the vicinity of marshes, wet meadows, streams, beaver ponds, glacial ponds, and lakes interspersed in subalpine forest. Successful breeding requires permanent or semi-permanent water, though breeding also takes place in temporary ponds. Snowmelt affects spring emergence and breeding.

Young toads are restricted in distribution and movements by available aquatic habitat, while adults can move up to several miles away. Adult toads emerge

from hibernacula in May (depending on snowmelt) and return in late August or early September. Most toads are in hibernation by October (Loeffler 2001).

Adults may linger at breeding sites for up to several weeks, then disperse. Larval development takes 2 months or more, depending on temperatures. Larvae commonly are present in the breeding ponds into August. Metamorphosis occurs primarily in August. Juveniles can often be found in wetlands adjacent to breeding sites (Hammerson 1999).

This species is known to occur on the GMUG. They were once common but now exist as apparently disjunct small populations. Current populations appear to be experiencing low reproductive success and high mortality (USDA 2005a). There are records of boreal toads in Garfield, Mesa, Delta and Gunnison counties (Colorado Herpetological Society website). The nearest known population is on the Grand Valley Ranger District, approximately 12 miles from the project area. Amphibian surveys conducted across the district in 2007 did not detect any boreal toads. There is only one identified potential amphibian habitat location within the project footprint, and one substantial potential site (Terror Reservoir) near the footprint. Several other small potential sites, primarily stock ponds, occur within 1 mile of the project area.

### **3.18.9b Boreal toad Environmental Consequences Proposed Action**

The following potential effects to boreal toads include:

- short-term direct effects from construction (loss of individual adults, egg masses or juveniles)

- loss of adults moving to or from breeding ponds, due to road traffic
- impacts to water quality during construction or operations

During spring and early summer, egg masses and juveniles potentially residing in area streams or ponds may be subject to mortality through impacts to wetlands such as siltation or fuel spills. However, standard Best Management Practices (BMPs) implemented in these types of projects make this unlikely. Adults may be killed through the action of heavy equipment during construction, or from traffic along roads leading to and from the project area. As surveys have yet to detect toads in this area or even on the Paonia district, mortality to eggs, juveniles, or adults is considered unlikely. However, toads may occur in this area and may not be detected during surveys. Future surveys will assist in determining the presence or absence of this species in this area. No net loss of suitable habitat will occur as a result of this project.

As toads have not been documented in this area during surveys, these impacts are highly unlikely, but the possibility cannot be discounted.

### **3.18.9c Boreal toad Cumulative Effects**

The cumulative effects analysis area for this species is the 6885-acre area surrounding the proposed treatments and activities. Activities in this area which may impact toads include grazing management and water depletions. This project, due to the absence of known populations in the vicinity, is unlikely to contribute significantly to cumulative habitat loss or degradation for this species.

### **3.18.9d Boreal toad Determination**

Implementation of the proposed action “may impact individuals or habitat, but will not likely contribute to a trend towards federal listing” of the boreal toad. As there are no known or suspected populations of this species in this area, impacts are unlikely, but potential impacts to this species, if it does occur in this area, do exist. However, the magnitude of potential impacts is slight due to standard mitigation measures (BMPs) implemented for these types of projects

### **3.18.10a Northern leopard frog Affected Environment**

This species is widespread and is known to occur on the Forest. Population trends are expected to be downward throughout much of their range. They occupy a wide variety of habitats. During the wet season leopard frogs disperse along aquatic and riparian corridors (USDA 2005a).

The formerly abundant northern leopard frog has become scarce in many areas of Colorado. Some populations have disappeared due at least in part to changes in habitat. Typical habitats include wet meadows, and the banks and shallows of marshes, ponds, glacial kettle ponds, beaver ponds, lakes, reservoirs, streams and irrigation ditches (Hammerson 1999).

There are records of northern leopard frogs in Garfield, Mesa, Delta and Gunnison counties (Colorado Herpetological Society website). Leopard frogs are known to occur in the Terror Creek area (district records) and in other portions of the North Fork Valley. There is only one identified potential amphibian habitat location within the project footprint, and one substantial potential site (Terror

Reservoir) near the footprint. Several other small potential sites, primarily stock ponds, occur within 1 mile of the project area.

### **3.18.10b Northern leopard frog Environmental Consequences Proposed Action**

The following potential effects to northern leopard frogs include:

- short-term direct effects from construction (loss of individual adults, egg masses or juveniles)
- loss of adults moving to or from breeding ponds, due to road traffic
- impacts to water quality during construction or operations

The northern leopard frog is known to occur in this watershed. During spring and early summer, egg masses and juveniles potentially residing in area streams or ponds may be subject to mortality through impacts to wetlands such as siltation or fuel spills. However, standard Best Management Practices (BMPs) implemented in these types of projects make this unlikely. Adults may be killed through the action of heavy equipment during construction or operations, or from traffic along roads leading to and from the project area. Habitat for this species will not be lost as a result of this project.

### **3.18.10c Northern leopard frog Cumulative Effects**

The cumulative effects analysis area for this species is the 6885-acre area surrounding the proposed treatments and activities. Activities in this area which may impact leopard frogs include grazing management and water depletions. Grazing can result in loss of riparian vegetation (foraging habitat and

cover) and trampling of egg masses. Water depletion can result in loss of wetlands through dewatering. However, frog populations have been located on the forest in areas with livestock concentrations (D. Garrison pers. obs.) and many of the suitable habitat features on the landscape were created for and managed for livestock use. This project, however, is unlikely to contribute significantly to cumulative impacts for this species.

#### **3.18.10d Northern leopard frog Determination**

Implementation of the proposed action would result in a “may impact individuals or habitat, but will not likely contribute to a trend towards federal listing” determination for the northern leopard frog. This is based on the possibility of individual mortality by vehicles or heavy equipment during construction or operations, the limited amount of suitable habitat near the project area, and the lack of habitat loss associated with the project.

#### **3.18.11a Bluehead sucker Affected Environment**

This species occurs in primarily in stream habitats below 7500' elevation in the Gunnison basin and elsewhere in the Colorado River basin. It is commonly found in small to midsized streams. Adults exhibit a strong preference for specific habitat types, often related to the presence of rocky substrate which they prefer. They have been found inhabiting streams with water temperatures as high as 28°C (Ptacek et al 2005). It has been documented in fisheries surveys in Hubbard Creek near the project area (Chris James, Zone Fisheries Biologist, pers. comm.)

#### **3.18.11b Bluehead sucker Environmental Consequences Proposed Action**

Actions with the potential for effects to this species include:

- impacts to water quality during construction or operations
- impacts to water levels during construction or operations

Implementation of BMPs to prevent siltation and transfer of contaminants to water during construction activities will occur, which reduces or eliminates the potential for direct or indirect impacts to this species. The majority of activity is far removed from Hubbard Creek and the creek itself receives large amounts of sediment from the erosive soils in the vicinity during normal precipitation and runoff (D. Garrison, pers. obs.). Water depletions of approximately 2.0 acre feet will occur as a result of these projects. Direct impacts from this are anticipated to be slight, as Hubbard Creek contains sufficient flow at most times of the year that loss of habitat will be minimal.

#### **3.18.11c Bluehead sucker Cumulative Effects**

This species is susceptible to cumulative impacts from water depletion downstream from the project sites, as are other warm water fish (see the Biological Assessment for this project). These cumulative impacts may cause loss of habitat quantity and quality in portions of the range of this fish.

#### **3.18.11d Bluehead sucker Determination**

Implementation of the proposed action would result in a “may impact individuals or habitat, but will not likely contribute to a trend towards federal listing” determination for the bluehead



sucker. This is based on the slight chance of direct impacts from siltation or contamination from pad sites or roads, and cumulative effects of water depletions to this fish downstream of the project site.

### **3.19 Management Indicator Species (MIS)**

#### **3.19.1 MIS Affected Environment General**

A complete table of all of the GMUG Management Indicator (MIS) species is presented in Appendix 2. The northern goshawk and American marten are also sensitive species and are discussed as such, and will not be further analyzed in this section. The Abert's squirrel is a ponderosa pine obligate, is not known or expected to occur in this area, and will not be discussed. The Brewer's sparrow is closely associated with sage habitats, which are not present in the immediate project vicinity, and will not be discussed.

#### **3.19.2 MIS No Action Alternative Environmental Consequences (common to all species)**

The direct and indirect impacts of the "no action" alternative would not change current habitat or population conditions of any Management Indicator Species in the short term. Long-term changes would continue to be dependent on existing conditions, succession of vegetative types, and other actions within the project area, as indicated in the cumulative effects appendix in the EA.

#### **3.19.3a Elk Affected Environment**

Elk are widespread and disperse readily across landscapes, with few habitat-related limitations. Populations are

abundant (and stable or increasing) on the Forests in R2 and both the GMUG and WRNF. Value of habitats on Forests is increasing as habitat on adjacent private lands is lost to human development. Females are sensitive to disturbance during calving and herds are sensitive to disturbance in the winter (USDA 2005b).

Elk use a combination of open meadows for foraging and woodlands for cover, calving and thermal regulation. The elk herds in the project area are migratory, using higher elevation forests and meadows during the summer. The project area lies within mapped elk summer range (CDOW <http://ndis.nrel.colostate.edu/ftp/index.html>) but is not a mapped calving or summer concentration area. The gob vent borehole system and associated roads, as well as the southern portion of the lease modification, lie within mapped elk winter range but are at the extreme upper elevation limit and may not be used during severe winters (as in 2007/2008).

The proposed activities lie within Game Management Unit (GMU) 521, which is part of elk Data Analysis Unit (DAU) E-14. The elk population estimate for this DAU, based on 2006 post-hunting surveys, was 11,490 elk (CDOW 2008a), while the objective is 9,000 to 11,000. The DAU had a ratio of 21.6 bulls to 100 cows after the 2006 season. CDOW estimated that during the 2006 hunting season (the last for which data is available) for GMU 521 there were 2,857 total hunters, who harvested 794 elk, a 28% success rate. (CDOW 2007). In 2008, CDOW revised their estimates of the elk population in this DAU to 17,000 animals (S. Duckett, pers. comm. to J. Grode). This represents a change in estimation techniques, not an actual increase of elk on the ground. The DAU

plan has not been modified as yet to accommodate changes in estimated elk numbers in this area.

The primary issues affecting elk distribution are lack of habitat security due to motorized and non-motorized travel and recreation activities (USDA 2005c).

### **3.19.3b Elk Environmental Consequences Proposed Action**

All environmental consequences are related to reasonably foreseeable development. The following potential effects to elk include:

- short-term direct effects during project activities (visual or auditory disturbance or displacement of individuals from machinery, vehicles and humans)
- calving season/elk production areas (May 15 to June 20)
- winter range
- long-term direct effects as a result of changes in forage and cover
- long-term indirect effects as a result of changes in human use in the area

Declines in elk use of habitat adjacent to forest roads have been documented in many studies (Lyon 1979; Rowland et al. 2000). A study of elk in relation to logging disturbances found that there was a buffer zone of 500 to 1,000 meters (1640-3280 feet) separating areas of high elk use from areas of disturbance (Edge and Marcum 1985). Another study looked at reproductive success of elk following disturbance by humans during calving season (Phillips and Alldredge 2000). They found that elk subjected to human-induced disturbance through a 3-4 week period during calving season

over two years showed lower calf survival. Generally, habitats provide more effective security the further they are from roads. Considering documented road avoidance by elk, the minimum distance between secure habitats and an open road is ½ mile (Hillis et al. 1991).

None of the habitat within the analysis area is designated as calving area or summer concentration area. However, elk occur throughout the Forest during summer, and may calve at any location on the Forest, including within the analysis area. Therefore, if activities occur during calving season, elk are likely to be displaced by project activities. Numerous studies have shown that elk will move back into an area once the disturbance is over and the displacement will be temporary.

The entire project area, and surrounding landscape, is considered as summer resident habitat.

Currently, summer recreational does occur in the area. Motorized use is limited to existing roads and trails. Access roads used would be closed after harvest and no increase in motorized use of the area after harvest is anticipated. Travel management in this area is under analysis at this time and may result in long-term changes in open road or trail use within the project area, depending upon that decision.

Project activities are anticipated to occur into all of the fall elk seasons within GMU 521. Disturbance to both local elk populations, and to hunters whose camps are no longer accessible or desirable due to harvest activities and/or traffic, is anticipated. As a result, changes to elk hunting pressure in both the immediate project vicinity and other portions of GMU 521 are expected. Due to the small scale of the disturbance and the size of the GMU, it is not anticipated

that harvest will change across the GMU.

A portion of the project area is mapped as winter range. However, this area is at the extreme upper elevational limit for winter range in this area, and elk typically winter at much lower elevations, where snow is not as deep. It is unlikely that activities in this area during winter would cause disturbance or displacement of any elk.

Because elk are very adaptable, and use a wide variety of habitats, the conversion of existing vegetation to an oak cover type would not have any measurable effects to elk at the population scale. Summer range is not a limiting factor for this population (K. Madariaga, pers. comm.), and thus alteration of summer habitat is unlikely to cause noticeable population changes. Alteration of habitats to open roads and bare well pads while project activities are ongoing would remove this habitat from use by elk, but long-term conditions after rehabilitation would return the area to suitability and help increase variety in habitats across the landscape. Elk habitat in the area is anticipated to be much more substantially impacted by the ongoing aspen decline than by this small-scale project. HABCAP modeling was used to determine the impacts of this habitat alteration within the cumulative effects area. The existing HCI for this area is 0.89 for elk summer habitat and 0.60 for elk winter habitat. Modeling of the implementation of these projects results in a change to the summer HCI value for this species to 0.88 when habitat is assumed to be lost during project activities. This includes the addition of roads within the analysis area. Upon completion of the project and rehabilitation of the sites, HCI returns to 0.89 for the analysis area. Winter values are not changed as a result

of project actions, either in the short term or the long term.

The elk population estimate for this DAU, based on 2006 post hunting statistics, was 11,490 elk, while the objective is 9,000 -11,000. Because this area is over the population objective, any potential increase in vulnerability to hunters as a result of the loss of cover is not expected to be an issue. In 2008, CDOW revised their estimates of the elk population in this DAU to 17,000 animals (S. Duckett, pers. comm. to J. Grode). This represents a change in estimation techniques, not an actual increase of elk on the ground. The DAU plan has not been modified as yet to accommodate changes in estimated elk numbers in this area. Long-term human use of the area is not expected to change as a result of this project, as no new access will be created in the long term.

The negative effects from this project are of short duration and magnitude and do not result in a Forest-wide decrease in trends or deter from meeting the MIS objectives in the Forest Plans.

### **3.19.3c Elk Cumulative Effects**

The cumulative effects analysis area for this species is the 6885-acre area surrounding the proposed treatments and activities. HABCAP modeling was used to determine the impacts of this habitat alteration within the cumulative effects area. The additional alteration of 24.1 acres of mature aspen to mountain shrub as a result of the Terror Creek ASA Project results in a summer HCI of 0.88, which is not a change from the immediate impacts of the minerals projects themselves. Again, winter HCI is not changed. Actions taken in this project are unlikely to interact substantially with other recreational, grazing, or special use actions as described in the cumulative effects table.

In addition, elk populations in this and other areas on the forest are much more likely to be directly influenced through management of hunting seasons by the Division of Wildlife than from habitat changes at minor scales.

**3.19.4a Merriam’s Wild Turkey Affected Environment**

Turkey are widespread and locally abundant across the Paonia district, especially in oak and other shrub habitats, but they occur in all areas below 10,000 feet at times. They are tolerant of human activities, and in winter are commonly found in yards and along roadways in close proximity to humans. They nest in a variety of

habitats on the district, although typically in areas with dense local cover. Brood rearing occurs frequently in areas such as opening, riparian areas, springs, burns, and aspen stands, all of which need invertebrates for food for the young birds. Populations of turkey are directly controlled by hunting seasons determined by the CDOW. Other population pressures include predation from species such as coyotes. Habitat alteration can have both harmful and beneficial impacts to turkeys, and treatments which provide a mosaic of habitat features, allowing for all life stages of turkeys, are desired for this species.

**Table 3.19.4a. Turkey habitat on the GMUG NF based on habitat parameters and quality**

| Habitat Parameter      | Habitat quality |           | Total acres |
|------------------------|-----------------|-----------|-------------|
|                        | Primary         | Secondary |             |
| Winter feeding / cover | 293157          | 27912     | 321069      |
| Summer feeding / cover | 490131          | 1281664   | 1771795     |
| Nesting                | 9587            | 101595    | 111182      |
| Brood rearing          | 718345          | 45879     | 764224      |
| Roosting               | 43974           | 200047    | 244021      |

**3.19.4b Merriam’s Wild Turkey Environmental Consequences Proposed Action**

All environmental consequences are related to reasonably foreseeable development. The following potential effects to turkey include:

- short-term direct effects during project activities (visual or

auditory disturbance or displacement of individuals from machinery, vehicles and humans

- short-term direct mortality of eggs/nests during project activities.
- long-term direct effects as a result of changes in forage and cover

- long-term indirect effects as a result of changes in human use in the area

Nesting typically begins in late April for turkeys, generally before all shrubs are leafed out. Nests usually occur within very dense local cover, and in forested stands are usually in areas with at least 60% canopy cover. If nests fail, turkeys will make multiple nesting attempts.

Individual nests could be directly lost or abandoned as a result of project activities, but turkeys may re-attempt nesting elsewhere if project actions are detrimental. Long-term effects in cover type and abundance are unlikely to cause substantial impacts to turkeys, as they utilize a wide variety of habitats, including oak types, in this area. Slash from operations, as well as dense oak habitats, can provide nesting habitat post-project. Long-term changes in human use of the area are unlikely to result from this project. HABCAP modeling was used to determine the impacts of this habitat alteration within the cumulative effects area. The existing HCI for this area is 0.71 for turkey summer habitat and 0.25 for turkey winter habitat. Winter habitat use of this area is limited by snowfall. Modeling of the implementation of these projects results in no change at this level of precision to the HCI values for this species, either in the short term or the long term.

The negative effects from this project are of short duration and magnitude and do not result in a substantial Forest-wide decrease in trends, or deter from meeting the MIS objectives in the Forest Plans

#### **3.19.4c Merriam's Wild Turkey Cumulative Effects**

The cumulative effects analysis area for this species is the 6885-acre area

surrounding the proposed treatments and activities. No change of either summer or winter turkey HCI results if models include loss of aspen as a result of the Terror Creek ASA Project. None of the ongoing or reasonably foreseeable future activities within this area, when combined with the proposed action, are likely to contribute to long-term cumulative impacts to this species.

#### **3.19.5a Red-naped sapsucker Affected Environment**

In Colorado, red-naped sapsuckers forage in aspen, willows and cottonwoods close to their nest sites, which are almost exclusively in mature aspen stands. Typical nest stands, dominated by large aspen, have a variety of diseases that create the heart rot needed for suitable cavity excavation (Kingery 1998). Nest stands have trees infected with shelf or heartwood fungus (for drilling nest cavities) and nearby willow stands (for drilling sap wells).

According to BBS, populations appear to be stable or increasing in the United States, with areas of local declines. From the period 1966 to 2006, the 3 sapsucker species (combined in the BBS analysis) have exhibited a positive trend of +3.4%. Within Colorado, populations have exhibited similar but higher upward trends (Sauer et al. 2007). Red-naped sapsuckers are seen in aspen stands throughout the district in relatively low numbers.

#### **3.19.5b Red-naped sapsucker Environmental Consequences Proposed Action**

All environmental consequences are related to reasonably foreseeable development. Actions with the potential for effects to this species include:

- short-term effects of disturbance during construction
- short-term potential for loss of young during construction
- long-term changes to habitat

The nest-building through fledging period runs from about May 20 through August 25 for this species (Kingery 1998). Project activities during this time may result in abandonment of nests or alteration of territorial boundaries in the project area.

Individual nests with eggs or young could be lost during project activities if sapsuckers occur in the treatment areas. This would most likely be either from nest abandonment due to disturbance, or through direct mortality.

Habitat changes in this area would be limited to alteration of less than 1 acre of mature aspen stands, suitable for nesting and foraging. HABCAP modeling for this species resulted in an existing HCI of 0.16 for this area, limited by the extent of aspen within the analysis area. Both short-and long-term impacts of this project are of such small scale that no change in HCI resulted at the precision level of the model.

The negative effects from these cumulative projects are of short duration and magnitude and do not result in a substantial Forest-wide decrease in trends, or deter from meeting the MIS objectives in the Forest Plans

### **3.19.5c Red-naped sapsucker Cumulative Effects**

The cumulative effects analysis area for this species is the 6885-acre area surrounding the proposed treatments and activities. HABCAP modeling assuming complete replacement of aspen within the Terror Creek Applied Silvicultural Assessment in the analysis area (24.10

acres of TAA 4C) with mountain shrub slightly lower the HCI of summer habitat in this analysis area to 0.15. While the HCI values for the analysis area seem to indicate that the area in general is not currently high quality habitat, the aspen component of the area has been only slightly impacted by man, and immediate changes to habitat quality at the landscape scale will be a result of the aspen decline and not direct harvest activities. Maintenance of the area for management indicator species such as the sapsucker is continuing at or above desired levels

None of the ongoing or reasonably foreseeable future activities within this area, when combined with the proposed action, are likely to contribute to long-term cumulative impacts to this species.

## **3.20 Other Species Considerations**

The golden eagle (*Aquila chrysoetos*) is known to occur in the area. There is one known nest location near Terror Reservoir (Monarch and Ward 2005) and other locations may exist within the project analysis area. This species is protected under the Bald and Golden Eagle Protection Act as well as other Federal and state laws, including the Migratory Bird Treaty Act. The Colorado Division of Wildlife has recently published Recommended Buffer Zones and Seasonal Restrictions for Colorado Raptors (CDOW 2008). In that document, specific protection measures for golden eagles are listed, and those measures are incorporated into the Conditions for Surface Use as described in the parent lease and above.

### **3.20.1 Conditions for Surface Use**

Pre-disturbance monitoring of this golden eagle nest to determine current

nesting status is required each season project activities may impact this nest. In addition, further surveying of the project area is required prior to initiation of project activities as no surveys have been done since 2005 in this area.

### **3.21 Migratory Bird Treaty Act**

Cumulative projects in the area may impact species protected under the Migratory Bird Treaty Act, even though this project does not. Project design criteria, including the Conditions for Surface Occupancy, will mitigate impacts substantially. However, some bird habitat will be lost in the short term as a result of cumulative projects, and that is likely to impact individual migratory birds, especially passerines and other birds which utilize oak for nesting. Due to the large amount of oak in the project area, and the relatively small quantity which will be lost as a result of the cumulative projects, these impacts are not anticipated to result in declines in populations of any species protected by the MBTA. Disturbed areas may provide foraging opportunities for some species, and eventual revegetation of project sites will result in restoration of habitats for impacted species

### **3.22 Range Resources and Other Land Uses Affected Environment**

#### **Introduction**

Dominant land uses within the region are mining, mineral exploration, agriculture, logging, residential development, and recreation. Specifics about land use within and adjacent to the coal lease modification are set forth in Section 3.1 Past, Present and Reasonably

Foreseeable Cumulative Actions Considered in this Analysis. This section describes the various land uses within and surrounding the coal lease tracts.

#### **Private and Public Lands**

The lease modification is all on federal lands.

#### **Utilities**

The Western Area Power Administration owns and operates the Curecanti-Rifle 2301345 kV electric transmission line that essentially parallels Terror Creek, west of the Bowie No. 2 Mine. The use area for this transmission line is 125 feet in width, including access roads. The transmission line structures are steel lattice with buried reinforced concrete bases. The electric transmission line would be protected from mining impacts as stated in the parent lease stipulation.

#### **Timber Operations**

The major timber harvest activities in the region have occurred in the Steven's Gulch area, which is 2 to 3 miles to the west of the proposed lease modification. Future large timber sales are not being planned in this area. Personal use sales may occur in the analysis area for the harvest of fence posts and fuel wood. These sales are generally very limited and scattered in nature. In total, the timber sales over the past 20 years in the Terror Creek and Hubbard Creek watersheds have affected approximately 2 percent of the watershed area. These sales have been completed. The Forest Service expects that small timber sales would occur in the future, but no major timber sales are planned.

#### **Oil and Gas**

Refer to Section 3.6.

### **Agricultural Activities**

Agricultural activities have historically been, and continue to be, a prominent part of the local Paonia economy. Fruit production (orchards) is generally confined to the valley floors and low mesas/terraces adjacent to the North Fork of the Gunnison River. In recent years, vineyards (and several wineries) have been developed and are being operated in the Paonia area.

Sheep and cattle grazing also occur on pasture land in the Paonia area, with summer livestock grazing occurring in the higher elevations within and adjacent to lands in the proposed in the lease modification.

Some pasture lands have been used for hay production.

### **Residential Activities**

There is no residential housing development planned for the coal lease modification area.

### **Recreation**

There are no developed recreation facilities operated by the proposed coal lease modification area. Hunting is the primary recreation activity within and adjacent to these areas. Other dispersed recreational activities occur in the area, but on a limited basis four-wheeling, hiking, picnicking, horse back riding, are all common recreational activities.

### **Inventoried Roadless Areas**

No Inventoried Roadless Areas exist within the parent lease or the lease modification.

## **3.23 Range Resources and Other Land Uses Environmental Consequences**

### **3.23.1 No Action**

Existing range and other land uses would continue in the lease modification areas. There would be no risk for surface tension cracks to form in ponds or on stock or recreation trails in the lease modification area.

Subsidence-induced ground movements have the potential to damage the stock ponds, fences or stocks trails if surface tension cracks form where these features are present. In the dry uplands in the area, stock ponds create important water sources for stock and wildlife. Loss of any water source would have negative impacts on the animal distribution and range health. If a crack were to form in an earthen stock pond, the pond may cease to hold water or cease functioning effectively. The probability for cracks to form under stock ponds in the area is negligible. Therefore, the risk to damaging stock ponds is low.

Subsidence of the land surface is not likely to damage fences. During subsidence, the land surface lowers gently, and without noticeable changes to the surface topography, therefore it is unlikely that fences would be damaged. Dispersed surface tension cracks may form across stock trails in the area. Cracks could pose a safety hazard to cattle if they formed and were present when cattle were on the allotment. The likelihood that cracks would form is considered low.



Subsidence-induced ground movements would not affect recreation opportunities in the lease modification areas, or affect the ability to gather dead fuelwood. Surface tension cracks may form on existing trails, but would be expected to close unaided.

### **3.23.2 Proposed Action**

Effects would generally be the same as No Action. In the long term, following mining, the area would be used much as it was before mining. Any surface subsidence caused by underground mining would be minimal and would not affect the pre-mining land uses. The reclamation and revegetation undertaken on any disturbed sites are commonly accepted techniques with a history of successful application in the area. Reclamation would be initially employed to provide for site stability, with revegetation allowing the disturbed sites return to pre-mining uses.

### **2.23.3 Cumulative Effects**

Mining and exploration would probably remain the dominant land uses in the immediate area of the coal lease modification.

Lands over the parent lease and lease modification also contain rangelands and improvements. Cumulative effects would include the potential for multiple disruptions of stock watering sources if ponds are damaged by subsidence. When surface activities occur, the vehicle traffic can have a negative impact on livestock management. The traffic can cause cattle to move out of an area; and the noise, dust and commotion can cause cattle to move away. This is a short-term impact and may not be substantial if the exploration area is limited in size, or the time period adjusted to account for the planned

grazing period. More significant is the impact of gates being left open. The stock grazing is partially controlled by fences. When fence gates are left open, stock may move into or out of an area before they should. To maintain control of stock movement, gates must be closed when needed in order to meet grazing management objectives.

New roads associated with coal exploration/development can also effect grazing management. New roads can help improve livestock distribution, especially in areas of oak brush. However, if new roads are left open to wheeled traffic, the positive effect is often negated by the increase in traffic. This impact can be mitigated by ensuring that all new roads constructed associated with coal exploration are reclaimed and left passable by foot and horse traffic only. With mitigation and reclamation, the implementation of any of the alternatives would not substantially affect the long-term land use or land use planning on National Forest System lands, BLM-administered lands, or adjacent private areas.

Subsidence would not noticeably alter the appearance of any of the area within the two coal lease tracts. Surface disturbances on the coal lease tract and the exploration area would be minimal and temporary, with reclamation returning disturbed areas to a stabilized and productive condition. Preliminary evaluations of other reclamation work in the area indicate that revegetation can be successfully accomplished at the time of closure.

There have not been any timber sales directly in the lease modification area, and none are planned. Since subsidence will not affect personal fuelwood gathering, there are no cumulative

effects to consider with regard to timber use of the area.

Cumulative effects to recreation use would include the potential for surface tension cracks to form on a trail that passes both through the lease modification areas and areas previously approved for leasing and mining. It is anticipated that surface tension cracks, if they form, would be dispersed and not concentrated. The cumulative effect would be minimal.

Post-mining land use would be similar for all alternatives. It would include livestock grazing, wildlife habitat, and dispersed recreation.

No effects of mining-induced seismicity are expected on the Curecanti-Rifle 2301345 kV electric transmission line.

#### **2.23.4 Conditions of Approval**

No additional conditions of approval are recommended other than those already identified in the parent lease.

#### **2.23.5 Consistency with Forest Plan and Other Regulations**

Proposed action is consistent with all aspects of Forest Plan regarding Range and other resources and Forest Service Manual 2200-Range Management.

### **3.24 Cultural and Heritage Resources Affected Environment**

Human use of the region has occurred for at least the last 8,000 years. Evidence of early occupation has been found on the nearby Grand Mesa where projectile points of the Early Archaic-Late Paleo period have been found. A recent excavation on the south flanks of the Mesa (the Land's End Aboriginal

Site) produced evidence of heavy use as a permanent camp up to 5,000 years ago. It is assumed that the West Flatiron area was also utilized during the warmer months for hunting, gathering and related resource processing.

Perhaps as early as 1400 A.D. the Ute Indians entered the area from the Great Basin region. By 1750 A.D., the Utes acquired horses and expanded their territory eastward over the Rockies and onto the Great Plains. Here they were heavily influenced by the Plains Indians and acquired the use of tipis and the art of beadwork. By the late 1800s pressure from miners, ranchers and farmers reduced the Ute territory to ever-dwindling reservations on the west slope of Colorado. After the Meeker Incident of 1879, all Northern Utes were removed to the Uintah-Ouray Reservation in Utah and the Southern Utes were confined to the Southern Ute and Ute Mountain Ute Reservations in southern Colorado.

Subsequent to the Ute removal, ranchers, then miners, moved into the area and small towns were established in the valleys surrounding the mountains. The mountain areas were used for grazing and seasonal cow camps were constructed. Coal mining and natural gas exploration occur today in the North Fork Valley in proximity to the project area.

Several heritage resource inventories have occurred within the proposed project area. All areas within this proposal were examined by an adequate heritage resource inventory and no significant heritage resources were located.

These inventories occurred in areas where there could have been a likelihood of discovering heritage resources, i.e.,

along the ridge tops and in the drainage bottoms. No rockshelters, overhangs, or historic structures were encountered. The only type of heritage resources that could be adversely affected by subsidence are rock overhang shelters/structures which have been shown to be at risk for damage due to subsidence (USDA-FS, 1999).

## **3.25 Cultural and Heritage Resources Environmental Consequences**

### **3.25.1 No Action**

No heritage or cultural resource sites would be affected.

### **3.25.2 Alternative 2**

No known heritage or cultural resources will be affected by the proposed action.

### **3.25.3 Cumulative Effects**

There will be no direct/indirect effects on known heritage resources, thus no cumulative effects will occur.

### **3.25.4 Conditions of Approval**

No additional conditions of approval are deemed necessary for heritage resources other than those occurring in the parent lease.

### **3.25.5 Consistency with Forest Plan and Other Laws**

Proposed Action is consistent with the Forest Plan and all other laws governing archaeological resources.

## **3.26 Transportation Affected Environment**

### **Regulatory Framework Roads and Trails**

Roads and trails are managed through the GMUG Forest Plan, the Gunnison National Forest Interim Travel

Restrictions, and Forest Service Handbook (FSH) 7700. Roads and trails are managed to provide public and administrative access, and recreational opportunities while protecting the quality of other resources, such as air quality.

### **Analysis Area and Methods**

The project and cumulative effects area of influence is State Highway 133 between Paonia and Somerset, CO; and Delta/Gunnison County Road (CR) 4405 to Forest Road 842 and 701.3C to the lease modification on existing access roads. no roads are currently located in the lease modification area.

The major transportation route in the Paonia and Somerset region is State Highway 133. This highway serves local vehicular and truck traffic for the communities in Delta and Gunnison Counties. The highway provides access to the coal handling facilities and existing spur rail line in the Somerset area, and to surface operations mines in the North Fork Valley.

State Highway 133 is an asphalt, all-weather, two-lane highway which has been periodically upgraded over the past 20 years. In 1996, the average daily traffic on Highway 133 east of Paonia was 3,150 vehicle trips per day. Traffic counts in the Somerset area average 2,000 per day and decrease to only 1,050 per day between the Somerset area and the town of Marble. Based on a one percent per year population growth rate, it is estimated that the 2008 average daily traffic on Highway 133 east of Paonia was approximately 3,550 vehicle trips per day. Traffic counts in the Somerset area average 2,280.

The GMUG manages NFSR 842 and 701.3c as a low standard road, suitable

for high clearance vehicles. The road is native surface with spot gravelling. Recently, about 2.5 miles of NFSR 701.3c have been upgraded with blading, gravelling, curve widening and turnout construction. BRL completed these upgrades under a Forest Service Road Use Permit for exploration.

Traffic use on NFSRs 701.3c and 842 is low. A small amount of traffic uses these roads for recreational purposes, including hunting.

Grazing permittees also use the road for access to range allotments. No Forest Service maintained trails exist in the modification area.

## **3.27 Transportation Environmental Consequences**

### **3.27.1 No Action**

Under the No Action Alternative, mining of the reserves at the West Elk Mine would continue at existing rates until the coal reserves are depleted. No additional impacts on the transportation system would be expected. On going effects related to methane drainage drilling and exploration would continue to occur on NFSRs 701, 701.3c and 842 until project completion, estimated to be in 2008. Other uses of the existing roads would continue to occur. No additional roads related to post-lease mining related operations on the lease modification would be considered.

### **3.27.2 Proposed Action**

No additional demand for transportation of employees to the mine surface operations facilities, or coal handling

and transport facilities would be required under this alternative. Mining operations and processing would be extended throughout the period required to mine available coal. The existing use of State Highway 133 as access to the mine operations and facilities would continue at close to the existing rate for an additional 1 month as a result of developing the lease modification (Appendix C). It is noted that existing rail transportation constraints currently limit the annual production from the North Fork Valley.

Subsidence may cause surface tension cracks to form on future road and/or trails that may be in the lease modification area. Depending on location above the mine working, cracks ranging from a few inches to a foot wide may form on a road. It is anticipated that surface tension cracks, if they form, would be dispersed and not concentrated, therefore, they would not affect the overall quality or usability of the area. Some cracks may naturally attenuate, and other may need to be repaired in order to maintain a safe travelway.

No additional impacts on transportation would be expected.

The existing use of State Highway 133 as access to the mine operations and facilities would continue at near the existing rate for an additional 2.5 years

### **3.27.3 Cumulative Effects**

It is foreseeable that NFSRs 711, 701.3c and 842 may be used for additional coal exploration drilling, methane drainage well installation, ventilation facilities, etc. There will likely be a small amount of traffic associated with installing water monitoring devices and subsidence

monitoring devices, along with trips to take measurements at these locations.

On a cumulative basis, if the lease modification were not approved, coal mining in the North Fork of the Gunnison River Valley would continue as permitted by existing leases and reserves. Other leases may be let elsewhere in the immediate vicinity of the lease modification or in the general area. Eventually, coal mining would cease as the coal reserves of existing leases deplete. Traffic and use of State Highway 133, NFSRs 711, 701.3c and 842 would continue for the next 10-15 years as needed for development/monitoring of existing leases.

The cumulative transportation effects of past, present and reasonably foreseeable actions in the North Fork of the Gunnison River Valley relative to coal mining operations would be negligible.

The Reasonably Foreseeable Surface Use (Section 1.7.2) notes that approximately 3 methane drainage wells may be needed over the life of the lease modification, which in turn would require temporary access roads to be built. The section assumes that up to 3 miles of roads assuming a 14-foot running surface would require approximately 5 acres of disturbance. The plan notes that exploration drilling and groundwater monitoring would use the same access roads but that additional temporary roads might be required for other mine activities. This surface disturbance would be temporary, as drill pads and temporary roads would be reclaimed by recontouring the land surface, obliterating the road prism, and revegetating the disturbed area.

#### **3.27.4 Consistency with Forest Plan and Other Laws**

The GMUG Amended Land and Resource Management Plan (Forest Plan), dated September 1991, and the BLM Uncompahgre Basin Resource Management Plan (RMP), dated July 1989, made provisions for coal leasing subject to the application of the coal unsuitability criteria established in 43 CFR 3461.

### **3.28 Coal Resource Recovery Affected Environment**

#### **Stratigraphy General**

The Bowie No. 2 Mine is located in the Paonia coal field on the Southern flank of the Piceance Creek structural and sedimentary basin. The area is bounded by Larimide structural and physiographic features as follows: On the East by West Elk and Elk mountains; on the South by the Gunnison Uplift; on the West-SW by the Uncompahgre Uplift; and on the North by the Grand Mesa-Piceance Basin. The local structure dips 4 to 7 degrees NE with minor rolls and faults offsetting this trend in certain areas.

#### **Coal Beds**

Coal in the Paonia field is found as six identified seams (generally by alphabet starting with A as the lowest seam) within the Mesaverde Group of late Cretaceous age. In the mine permit area, only the B and D seams have hosted producing mines. Within the general area, the A and C seams are not of mineable thickness, and portions the D-Seam is split into three thin seams. An intrusive sill has burned or coked up to half the Lower B-Seam leaving only a portion that may be mineable; however,

the upper and lower B-Seam average interburden of 35 feet may not allow mining the lower seam after mining the upper seam. The E and F-Seams are not of mineable thickness. Both B seam splits have ten to twelve feet of mineable thickness and good quality.

### **Coal Quality**

The B-Seam coal is high volatile C bituminous with an "as received" analysis for the moisture, ash, sulphur, and BTU content based on drill hole samples expected to be approximately: Moisture 6.93 % Ash 7.98% Sulphur 0.50% BTU 11,997.

These reserves can meet compliance coal standards for sulfur and ash content for markets currently supplied by BRL. A wash plant owned by BRL is available to mitigate any non-compliance coal should either in-seam or mining related dilution lower the compliance of the mined product.

### **Mining Factors**

*METHOD CONSTRAINTS* - Geologic constraints relating to coal depth and thickness within the IPM3, and economic constraints and equipment availability for the applicant dictate that the underground longwall method be employed to extract the coal from the modification area. The amount of overburden on the modification area varies from approximately 1,200 ft. to 2,000 ft. over the Upper B-Seam, and averages about 1,600 ft. This overburden necessitates underground mining and since BRL already owns underground longwall mining equipment, they would employ it to mine the coal reserves.

*PRODUCTION FACTORS CURRENT-Short Term Schedule* - Production to meet the market demand is supplied by three active development sections and one longwall section. As of December

2007 the fee reserves were depleted so that all future production is expected to come from federal coal. The sections are scheduled to work on daily rotating shifts with a monthly schedule totaling about 1500 operating shifts per year. As the COC61209 reserves are depleted, the workings will proceed to the C-37210 federal lease (COC57202 LMU).

*Production Data* - The current operation completed mining of the D-Seam in March 2005, and transitioned to the Bowie No. 2 Mine B-Seam portals and workings. BRL successfully mines coal using the longwall method of mining by developing longwall blocks using continuous miners. Mains and gateroads are developed ahead of longwall mining to allow a longwall move about every six to nine months. Recovery overall is about 60% with a rate of mining at about 5 million tons per year. BRL intends to maintain a production rate of 5 to 6 million tpy in order to meet financial cash flow demands for the operation.

*Mining Equipment* - The following is a list of major equipment currently used by BRL and is typical for use in an underground longwall operation:

- Continuous Miners 3
- Roof Bolters 3
- Shuttle Cars 9 Utility Scoops 2
- Utility Haulers 2
- Utility Mantrips 4
- Shield Puller 1
- 60" Belt Drives 9
- Shield Hauler 2
- Shearer 1
- Face Shields & Pans 180 (30 spares)
- Main Mine Fan 1 (with 1 additional during life of mine)

*Life of Mine* - The B-Seam (combined upper and lower) recoverable reserves currently known to be available to the

Bowie No. 2 mine operation on the COC61209 lease total about 11.96 million tons of federal coal with a mine plan orienting remaining COC61209 LW panels about N-S. There is potential for more recoverable reserves on current lease holdings in their suspended LMU totaling about 10.54 million tons. The lease modification would add about 2.78 million tons bringing the grand total to about 25.28 million tons. There is also potential recoverable reserves on unleased federal coal to the north that is expected to be explored over the next two years. At the projected 5 million tpy production rate the life of mine would be about 5 years with potential for an estimated 5 additional years if more reserves are proven.

**Manpower** - The current manpower level averages about 255.

**Production Data** - The operation would extract coal from B coal seams. Panel geometry and recovery would change to N-S on the remaining area in the COC61209 lease.

**Mining Equipment** - There would be no change.

**Life of Mine** - The existing combined federal holdings represent about 5 years of mine life. The lease modification would add only about 2.78 million tons of B-Seam recoverable reserves, but would also serve to allow revised panel layout such that recovery on the north side of federal lease COC61209 could be optimized. Although this adds about one-half year to the life-of-mine, it is a welcome consequence better than bypassing available reserves. Actual years of operations on the lease modification could last over an extended time since coal production from the adjacent federal coal leases could be realized in conjunction with production from the lease modification. Mining in

the lease modification and in the adjacent properties could take 5 years (Mine Life), but it is likely that the lease modification itself will be mostly mined-out about one year after being entered.

**Manpower** - The manpower requirements would remain the same at about 215 employees.

#### **SURFACE FACILITIES**

The current surface coal handling facilities of the BRL mining operation located on Bowie fee surface would serve the needs of the operation even with additional coal leased as proposed in the lease modification as applied for by BRL.

#### **TRANSPORTATION**

The current transportation infrastructure at the Bowie No. 2 mine would serve the mining needs of the operation even with the addition of the lease modification. There is a conveyor belt system in place from the train load-out to the current working area underground. This system could be extended to working faces in the lease modification.

### **3.29 Coal Resource Recovery Environmental Consequences**

#### **3.29.1 No Action**

There would be no coal recovered from the lease modification area under the No Action Alternative.

#### **3.29.2 Proposed Action**

The following consequences do not readily portray that the lease modification is replacing acres that MSHA has determined were unsafe to mine.

### **Estimated Recovery**

The B-Seam recovery within the lease modification should be that for underground longwall taking nearly full seam height in the LW block and about 9' in development calculated to be 78%. Because there would be more LW GER / MER Report to development area mined, this recovery is about 10% higher than overall mine recovery which is about 65% of mineable reserves. The existence of an intrusive sill in the Upper B-Seam could render a portion of the lease modification B-Seam unmineable or just partially recoverable but there is also a chance that one or two blocks may be extended longer.

B-Seam recovery will be enhanced on federal coal lease COC61209 with the addition of the lease modification by facilitating longer blocks crossing the current north boundary. If the blocks were terminated at the current boundary BLM calculates the recovery of the B-Seam on COC61209 would be increased by about 137,000 tons.

### **Potential Markets**

The current Bowie No. 2 mine primarily supplies coal for electric power plants. The approximate breakdown of market destinations for the coal is shown below:

1. Electric Utilities (TVA and others) 95-98%
2. Manufacturing Plants (Coke, cement, etc.) 2 - 5%

### **Maximum Economic Recovery Determination**

The lease modification area BRL applied for has been determined by availability of mineable coal (constrained by projected quality, surface protection of Terror Reservoir & Hubbard Creek, and adjacent federal holdings). It is located in such a way as to allow the Bowie No.

2 mine access to a modest portion of federal coal reserves which in turn allows better mine orientation to remaining federal coal currently held by BRL. Although neighboring coal companies exist in the proximity, there is no indication of interest in the lease modification. It is not possible that a third party would deem the coal resource in the lease modification either substantial or valuable enough for them to initiate new surface and underground facilities.

It has been determined by BLM that Maximum Economic Recovery (MER) of the lease modification federal lease application can be achieved by underground mining using the longwall method of mining as described above.

## **3.30 Social and Economic Resources Affected Environment**

The Environmental Justice Executive Order 12898, released by the White House in February 1994, places attention on any adverse human health and environmental effects of agency actions that may disproportionately impact minority and low-income populations.

Low-income populations are households that live below the subsistence or poverty level as defined by local, states, or national government. The Order simultaneously directs Federal agencies to avoid making decisions that discriminate against these communities.

Environmental justice means that to the greatest extent practicable and permitted by law, 1) populations are provided the opportunity to comment before decisions are rendered on, and 2) are allowed to share in the benefits of, are not excluded from and are not affected in a disproportionately high and adverse



manner by government programs and activities affecting human health or the environment.

The area of influence for the social and economic elements of this EIS includes both Delta and Gunnison counties in west central Colorado.

The cumulative impact area would include both Gunnison and Delta counties. Baseline data for the counties in the area of influence includes population and demographic data as well as current business and economic statistics information for the Information in this section was obtained from the US Bureau of the Census based on the 2000 census data and 2004 estimates. Additional information was obtained from the Sonoran Institute (2004).

### Population

Table 3.30a (population) presents basic population and demographic information for the Delta County and the state of Colorado. Delta County comprises 1,142 square miles with 24.4 people per square mile and a total population of 27,834 people in 2000. Delta County's population grew by almost 33 percent between 1990 and 2000. According to the Sonoran Institute (2004), Delta County's population grew slower than the state but faster than the nation between 1970 and 2000, with an annual average growth rate of 2.7 percent. The median age in Delta County is 42.3 years with 24.0 percent of the population being under the age of 18 and almost 20 percent being 65 years or older. Over 80 percent of the people age 25 and older in Delta County have graduated from high school, and just over 17 percent have graduated from college (US Census Bureau 2006).

**Table 3.30a. Population by Category, 1990 and 2000, Delta County and the State of Colorado**

|                   | 1990      | 2000      | Percent Annual Change 1990-2000 |
|-------------------|-----------|-----------|---------------------------------|
| Population        |           |           |                                 |
| Delta County      | 20,980    | 27,834    | 3.3                             |
| Colorado          | 3,294,394 | 4,301,261 | 3.1                             |
| Male              |           |           |                                 |
| Delta County      | 10,353    | 13,972    | 3.5                             |
| Colorado          | 1,631,295 | 2,165,983 | 3.3                             |
| Female            |           |           |                                 |
| Delta County      | 10,627    | 13,862    | 3.0                             |
| Colorado          | 1,663,099 | 2,135,278 | 2.8                             |
| Under 20 years    |           |           |                                 |
| Delta County      | 5,571     | 7,291     | 3.1                             |
| Colorado          | 958,341   | 1,224,668 | 2.8                             |
| 65 years and over |           |           |                                 |
| Delta County      | 4,691     | 5,473     | 1.7                             |
| Colorado          | 329,443   | 416,073   | 2.6                             |
| Median Age        |           |           |                                 |
| Delta County      | NA        | 42.3      |                                 |
| Colorado          | NA        | 34.3      |                                 |

Source: Sonoran Institute 2004.

Social and Economic Resources population grew slower than the state but faster than the nation between 1970 and 2000, with an annual average growth rate of 2.7 percent. The median age in Delta County is 42.3 years with 24.0 percent of the population being under the age of 18 and almost 20 percent being 65 years or older. Over 80 percent of the people age 25 and older in Delta County have graduated from high school, and just over 17 percent have graduated from college (US Census Bureau 2006).

The town of Delta is the largest town in Delta County with a 2004 population of 8,087, an increase of 26 percent since 2000. Other communities in the county include Cedaredge (2004 population of 2,190), Crawford (2004 population of 397), Hotchkiss (2004 population of 1,024), Orchard City (2004 population of 3,094), and Paonia (2004 population of 1,639) (Region 10 2005).

The 2000 US Census reports that there were 12,374 housing units in Delta County that housed 11,058 households, indicating a vacancy rate of less than 11 percent. Only 3.7 percent of the vacant houses are classified as seasonal, recreational, or for occasional use.

Approximately eight percent of rental units were classified as vacant. There were 2.43 persons per household. Delta County had a home ownership rate of 77.5 percent in 2000, well above the state average of 67 percent. The median value of an owner occupied housing unit was \$115,500, well below the state average of \$166,600 (US Census Bureau 2006).

Table 3-29b (population) presents basic population and demographic information for the Gunnison County compared to the state of Colorado.

**Table 3.30b Population by Category, 1990 and 2000, Gunnison County and the State of Colorado**

|                   | 1990      | 2000      | Percent Annual Change 1990-2000 |
|-------------------|-----------|-----------|---------------------------------|
| Population        |           |           |                                 |
| Gunnison County   | 10,273    | 13,956    | 3.6                             |
| Colorado          | 3,294,394 | 4,301,261 | 3.1                             |
| Male              |           |           |                                 |
| Gunnison County   | 5,442     | 7,563     | 4.0                             |
| Colorado          | 1,631,295 | 2,165,983 | 3.3                             |
| Female            |           |           |                                 |
| Gunnison County   | 4,831     | 6393      | 3.2                             |
| Colorado          | 1,663,099 | 2,135,278 | 2.8                             |
| Under 20 years    |           |           |                                 |
| Gunnison County   | 2,998     | 3,308     | 1.0                             |
| Colorado          | 958,341   | 1,224,668 | 2.8                             |
| 65 years and over |           |           |                                 |
| Gunnison County   | 657       | 965       | 4.7                             |
| Colorado          | 329,443   | 416,073   | 2.6                             |
| Median Age        |           |           |                                 |
| Gunnison County   | 28.3      | 30.4      | .7                              |
| Colorado          | NA        | 34.3      | NA                              |

Source: Sonoran Institute 2004, US Census 2000.

Gunnison County comprises 3,260 square miles with 4 people per square mile and a total population of 13,956 people in 2000. Gunnison County's population grew by almost 36 percent between 1990 and 2000, slightly more than 3.1 percent rate of increase of the state population.

The median age in Delta County is 30.4 years with 24.0 percent of the population being under the age of 20 and 7 percent being 65 years or older. Over 94 percent of the people age 25 and older in Gunnison County have graduated from high school, and just over 76 percent have graduated from college (US Census Bureau 2006).

Gunnison is the largest town in Gunnison County and the county seat. Gunnison's population in 2000 was 5,490. Crested Butte is the other larger community in Gunnison County with a 2000 population of 1,529. Somerset, where the West Elk Mine is located, is an unincorporated town with a population in 2000 estimated at 190 and 201 estimated in 2005. All three communities are increasing slightly in population.

The 2000 US Census reports that there were 9,135 housing units in Gunnison County with 5,649 occupied and 3,486 vacant. Nearly all the vacant units are seasonal, recreational, or for occasional use (3,125). Approximately 5.5 percent of rental units were classified as vacant. There was an average of 2.30 people per household. Gunnison County had a home ownership rate of 58.3 percent in 2000, below the state average of 67 percent. The median value of an owner occupied housing unit was \$189,400, higher than the state average of \$166,600 (US Census Bureau 2006).

### **Economic Resources**

The area of influence for economic resources is comprised of Delta and Gunnison Counties.

Delta County is the county of residence for most of the mining personnel and supports most of the indirect employment that provides supplies and services to mine workers and their families. Gunnison County is included in the area of influence because the West Elk Mine is in Gunnison County, and the county receives royalty and tax revenues from the mine.

Gunnison County receives about \$2 million annually in tax revenues from the West Elk Mine. Mining companies are the largest property tax revenue sources for Gunnison County. Gunnison

County has identified the areas surrounding the coal mines as the *North Fork Valley Coal Resource Special Area*.

Together, these counties supported 24,519 full and part-time jobs in 2000, an increase of 16,007 jobs since 1970. In 2004, in Gunnison County, 655 of its 7,511 wage and salary jobs are in the mining sector, and increase of 55 jobs since 2000. Mining employment in Delta County was not reported because the data was suppressed for confidentiality (Region 10 2005).

The unemployment rate in Gunnison County in 2004 was 4.2 percent, below the statewide average of 5.5 percent. The Delta County unemployment rate of 5.2 percent, is also lower than the statewide average (Region 10 2005).

As of spring, 2008, the Bowie Mine No. 2 employed approximately 255 full and part time workers with an annual payroll of approximately \$26.4 million.

Average mining wages in Gunnison County in 2004 (\$64,220) were more than twice the average wage for all employment sectors (\$26,832) (Region 10 2005). The North Fork Mines spent up to \$100 million in 2006 locally for materials, supplies, and services, and royalty and tax payments for Bowie No. 2 Mine totaled approximately \$13 million. Total direct economic benefits associated with the North Fork Mines exceed \$60 million annually.

### **Environmental Justice**

Executive Order 12898 (Feb. 11, 1994), *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations* was executed to avoid a disproportionate placement of adverse environmental, economic, social, or health effects from Federal actions and policies on minority and

low-income populations. Analysis requires the identification of minority and low income populations that may be affected by any of the alternatives.

The area of influence for environmental justice is Delta County, Colorado, where the majority of West Elk Mine workers and their families live. Demographic information on ethnicity, race, and economic status is provided in this section as the baseline against which potential effects can be identified and analyzed.

**Identification of Minority and Low Income Populations**

For purposes of this section, minority and low income populations are defined as follows: Minority populations are persons of Hispanic or Latino origin of any race, Blacks or African Americans, American Indians or Alaska Natives, Asians, and Native Hawaiian and other Pacific Islanders.

Low-income populations are persons living below the poverty level. In 2000, the poverty weighted average threshold for a family of four was \$17,603 and \$8,794 for an unrelated individual. Estimates of these two populations were then developed to determine if environmental justice populations exist in Delta County (Table 3.30c).

**Table 3.30c Minority or Low-income Populations Delta County and State of Colorado, 2004**

| Location          | Total Population | Percent Minority | Percent below poverty (2003) |
|-------------------|------------------|------------------|------------------------------|
| Delta             | 29,947           | 15.0             | 13.2                         |
| State of Colorado | 4,665,177        | 27.5             | 10.0                         |

Source: US Census Bureau 2006.

Minority populations were lower in Delta County than in the state of Colorado; the low income population in

Delta County was higher than for the state of Colorado.

The Council on Environmental Quality (CEQ) identifies minority and low income groups as EJ populations when either (1) the population of the affected area exceeds 50 percent or (2) the population percentage in the affected area is meaningfully greater (generally taken as being at least 10 percent more) than the population percentage in the general population of the region or state. Neither the minority population percentage nor the low-income population percentage that would be affected by the project meets the CEQ guidelines. As a result, it is assumed that no environmental justice populations exist within the area of influence, and no impact analysis is required.

**Protection of Children**

Executive Order 13045, *Protection of Children from Environmental Health Risks and Safety Risks* (April 21, 1997), recognizes a growing body of scientific knowledge that demonstrates that children may suffer disproportionately from environmental health risks and safety risks. These risks arise because (1) children’s bodily systems are not fully developed, (2) children eat, drink, and breathe more in proportion to their body weight, (3) their size and weight may diminish protection from standard safety features, and (4) their behavior patterns may make them more susceptible to accidents. Based on these factors, the President directed each Federal agency to make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children. The President also directed each Federal agency to ensure that its policies, programs, activities, and standards address disproportionate risks to children

that result from environmental health risks or safety risks.

Children are seldom present at the coal mining facilities. On such occasions, the coal mining companies have taken and will continue to take precautions for the safety of children by using a number of means, including fencing, limitations on access to certain areas, and provision of adult supervision. No additional impact analysis is required.

### **3.31 Social and Economic Resources Environmental Consequences**

#### **3.31.1 No Action**

Under the No Action Alternative, the primary impact would be that the estimated 130,000 tons of recoverable coal would not be mined.

Mining of the reserves at the Bowie No. 2 Mine would continue at existing rates until the available coal reserves are depleted in 2012. Job and associated salaries, local expenditures, royalty (\$30.6 million) and tax payments would not be realized after the reserves are depleted (2012). This alternative would limit the opportunity to realize economic benefits. The Federal government would not receive the rents and royalties associated with mining the coal in the Federal Coal Lease COC-60219 proposed lease modification area in addition to the area that was determined unsafe to continue mining.

#### **3.31.2 Proposed Action**

Existing employment opportunities at the Bowie Mine No. 2 would continue. No additional demand for housing or municipal services would be anticipated.

Mining operations would be extended throughout the period required to mine

the additional 130,000 tons of recoverable coal reserves in the B Seam in the lease modification plus the approximate 4 years of permitted reserves at the present average monthly extraction rate (416,667 tons per month). The B Seam coal would be mined from about 2008 to 2012. The extension of mining operations would also extend the annual payroll, local expenditures, and taxes and royalty payments.

The direct economic benefits associated with continued mining at the Bowie No. 2 Mine would equal approximately \$1.1 million per month, which equates to approximately \$52 million for the 4 year remaining life of the mine. Due to expected quality of the coal, the value may be somewhat less.

Royalty payments are 8 percent of the value of the coal removed from an underground mine (43 CFR 3473). The royalty on the value of the B-Seam coal is approximately \$3.3 million. Of royalties from the Federal coal, 50 percent returns to the Federal treasury in the general fund and 50 percent is returned to the state where the coal was mined, with a portion of that percentage being returned to the county where the coal was mined. In Colorado, those funds are managed by the State Department of Local Affairs in the Energy Impact Fund. These monies are distributed on a grant-like basis to counties affected by energy resource development for community benefit projects.

#### **3.31.3 Cumulative Effects**

The cumulative social and economic effects of past, present and reasonably foreseeable actions in the North Fork of the Gunnison River Valley relative to coal mining operations would be to continue the mining employment sector pretty much the same as it is.

Coal mining at other coal mines in the North Fork of the Gunnison River Valley would continue. Delta and Gunnison counties are currently adding approximately 530 full-time or part-time positions annually accounts for nearly one percent of the employment in the area of influence (255 out of 24,519 full time or part time jobs). Mining accounts for 655 jobs, a loss or reduction in employment of 255 (39 percent) at the Bowie Mine No. 2 would adversely affect the mining jobs available and the overall salary of jobs in the county.

Cumulatively, the continued operation of the Bowie No. 2 Mine until 2012 will contribute to the overall important, beneficial impact on Gunnison and Delta Counties from mining. The proposed action and other ongoing and reasonably foreseeable coal mining operations would continue to directly provide approximately 10 percent of the employment, pay the largest amount of property taxes and maintain a relatively high general salary for the area.

#### **3.31.4 Consistency with Forest Plan and Other Laws**

Proposed Action is consistent with Executive Orders 12898 (Feb. 11, 1994) and Executive Order 13045 (April 21, 1997) addressing Environmental Justice and the Protection of Children from Environmental Health Risks and Safety Risks respectively, the 1991 GMUG Forest Plan and 1989 BLM Uncompahgre Basin Resource Management Plan (RMP).

### **3.32 Visual Quality Affected Environment**

Visual resource management is guided by the GMUG Forest Plan (USDA FS 1983 as amended 1991). Visual resource management promotes protection, and if

possible enhancement, of the visual quality of an area.

The project area includes the viewsheds (Lower Hubbard Creek, Alder Creek, Terror Creek watersheds) potentially affected by the methane drainage and ventilation shaft development. The GMUG determined Visual Quality Objectives (VQOs) when the land resource management plan was developed in 1983. Since then, the FS has changed to the Scenery Management System (SMS) described in Agricultural Handbook 701 (USDA FS 1995). The GMUG uses a SMS and VQOs respectively to evaluate visual resources. VQO criteria include landscape character, scenic attractiveness, scenic integrity, concern levels, and distance zones. Landscape character expresses the visual image of a geographic area and consists of the combination of physical, biological, and cultural attributes that make each landscape identifiable or unique. The term delineates landscape attributes that distinguish an area. The landscape character of the project area is generally natural appearing with interspersed FS roads and livestock management facilities such as fences, water tanks, and corrals. Tree cover patterns help shield the access/road and adjacent mining activities, creating a visual combination of rock, water, and trees, which make up the aesthetic qualities of the area. The existing access roads are the predominant man-made feature of the landscape in the project area. Scenic Attractiveness is a class rating of the relative scenic value of a landscape. The project area is all in the typical class. Residents and tourists visit the area for scenic and recreation values.

The Forest Plan has assigned the VQO of modification to the majority of the project area, however, the middle,

generally over Minnesota Creek and Deep Creek are partial retention.

These VQOs can be translated into the SMS as low scenic integrity for modification and moderate scenic integrity for partial retention.

Low scenic integrity appears moderately altered, while moderate scenic integrity appears slightly altered. The project area is not directly visible from a public highway, including the Grand Mesa Scenic and Historic Byway, or from the West Elk Loop Scenic Byway, both Concern Level 1 (high scenic integrity) travelways. The major transportation route in the Paonia and Somerset region is State Highway 133. This highway serves local vehicle and truck traffic for the communities in Delta County, including providing access to the coal handling facilities and existing spur rail line in the Somerset area and to operations at the West Elk Mine in the North Fork Valley. The FS transportation system in the area is primarily made up of secondary travelways and low use areas managed as Concern Level 3 (low scenic integrity). NFSR 842 traverses near project area and is considered a Concern Level 2 (medium scenic integrity) travelway.

### **3.33 Visual Quality Environmental Consequences**

#### **3.33.1 No Action**

Under the No Action Alternative, the proposed the coal lease modification would not be approved. However, existing methane drainage and exploration activities would continue under separate permits, so minimal impacts to the visual environment would

still be expected if the No Action Alternative is selected.

#### **3.33.2 Proposed Action**

Under the proposed action, well pads and new road would be developed for the long term operation of the mine. These impacts would be consistent with the modification and partial retention VQOs in the GMUG land and resource management plan. A portion of the project area is Concern Level 2 (medium) because it would be visible in the foreground (within 0.5 mile) and middle ground (between 0.5 and four miles) from the open NFSR 842.

The rest of the project area is Concern Level 3 (low), where areas would be visible in the background (more than four miles from the road). Project related disturbance would be observable in the foreground and middle ground from NFSR 842, but the visual impact to forest users would be limited to fall months due to these areas being restricted (gated) from public access. New roads developed for the proposed action would preclude public motorized access for the life of the project. Limited access along these travelways would likewise limit access to the immediate viewshed. Proposed protection measures and road use stipulations to reduce visual line and contrast would minimize the long term impact to visual management.

Construction and reclamation activities would affect form, line and color patterns.

#### **3.33.3 Cumulative Effects**

Long-term reasonably foreseeable ground disturbing activities associated with the Proposed Action and previous methane drainage and historical use route would be minimally visible.

Though these disturbances would be reclaimed, or viewshed access restricted by gates and road closures, a long term visual quality impact could be anticipated throughout the project area due to the alteration of line and form and color with the addition of differing vegetation.

The impact within the project area would be minimal based upon the limited effect on VQO criteria. It would be anticipated that long and short term VQOs would be met in this area.

#### **3.33.4 Conditions of Approval**

No conditions of approval regarding visuals are recommended.

#### **3.33.5 Consistency with Forest Plan and Other Laws**

Reasonably foreseeable ground disturbing activities may be visible but, since they would be reclaimed the visual quality of the viewshed would not be impacted over the long-term. In the long and short term, VQOs would be met. Proposed Action is consistent with VQOs defined in the Forest Plan and the SMS.

### **3.34 Noise Affected Environment**

The noise generated from exploratory equipment operating in an unpopulated area would be noticeable even when the equipment causes noise increases as low as 2 dBA.

Noise has historically been recognized as a health hazard with the potential for causing hearing damage. Efforts by industry and regulatory actions have lessened the likelihood for hearing damage occurrence. For example, the U.S. Mine Safety and Health Administration (MSHA) imposes noise

standards on coal mining operations for worker hearing protection.

A secondary impact associated with noise is the nuisance effects of noise that include interference with speech, psychologically unsettling environment at home and work, and more specific problems such as sleep disruption. The extent of these effects varies, sometime significantly, between individuals and as a factor of the noise source. The noise characteristics which affect the listener's response include overall loudness, sound pressure level, duration of exposure, time distribution of occurrence, and sound frequency. Other factors include the listener's total exposure, age, and individual susceptibility.

Background noise level measurements at representative locations around the project site were taken on April 21, 1999 and April 23, 1999 were taken during a period when there were no mine related trucks or trains. Rural background measurements were taken during the daytime and nighttime at two locations on Garvin Mesa and at one location next to State Highway 133. Some of the monitoring points in Paonia and Hotchkiss were later used to measure noise levels caused by passing trains.

In general, the background noise measurements were as expected. The quietest measurements taken at night on Garvin Mesa were 36 dBA, with the predominant noise levels being natural bird sounds. Routine daytime noise levels in the Paonia and Hotchkiss residential areas were 48 to 56 dBA with predominant sounds produced by routine local traffic. At the rural site near State Highway 133, measurements showed 41 to 49 dBA during brief periods of no discernible traffic, and spot noise levels of 64 dBA while a coal truck passed.



Noise levels during passing trains at sites in Paonia and Hotchkiss registered noise levels ranging from 51 dBA, for a westbound train, at a point 550 feet from the tracks, to 100 dBA for an eastbound train in Paonia approximately 30 feet from the tracks. Train whistle noises measured 110 dBA at a point 30 feet from the tracks in Paonia and 106 dBA in Hotchkiss at a point 40 feet from the tracks.

Because decibels are measured on a logarithmic scale, a doubling of the sound pressure corresponds to a noise increase of 3 dBA. For example, a single bulldozer typically produces a sound level of about 80 dBA at a distance of 50 feet from the bulldozer. Two identical bulldozers working side by side would give a noise reading of 83 dBA, and this noise would be perceived as barely louder than one bulldozer.

There are many factors that determine whether an increase in the noise level above the existing background is "audible." The most important factor is the nature of the new noise source as compared to the nature of the background noise. In the case of noise generated from industrial sites such as mining, or the noise generated from coal truck and/or train traffic, this noise would be different from rural background sounds, so relatively small increases in such noise levels caused by mechanical equipment would be noticeable.

The focus of the noise analysis is centered on the mining and transportation activities for coal operations in the North Fork of the Gunnison River Valley.

## **3.35 Noise Environmental Consequences**

### **3.35.1 All Alternatives**

Typically, the noise emissions as a result of the operation of the surface facilities for the underground mines are not expected to be a general nuisance to nearby towns and residents.

The major noise nuisances associated with these mines would result from truck and railroad transportation of coal; these impacts are expected to occur on continued basis with future coal production from presently permitted coal production rates for valley mines.

#### **Noise Impacts From Surface Facilities**

Noise from routine mining activities at the surface facilities of Bowie and Oxbow would not create any unacceptable noise levels at the nearest homes. Measurements of noise levels near surface facilities of these mines showed that ambient noise levels are low. Noise levels taken at the valley floor beneath the Bowie No. 2 Mine surface facilities ranged from 39 to 46 dBA and were scarcely discernible above background noise. Noise readings taken by Oxbow at homes nearest their surface operation at Somerset ranged from 55 to 61 dBA, but those noise readings were dominated by public traffic.

Ventilation fans would generate a "white noise" sound that would be barely discernible at a distance of 3 to 4 miles.

Under certain meteorological conditions with quiet background, it is possible that noise from the surface facilities of the Bowie No. 2 Mine could be audible at Garvin Mesa, approximately 2 miles

west of the surface facilities. Under certain conditions, the noise could be perceptible as a nuisance. Generally, however, environmental impacts of that relatively quiet noise would be minor. Most of the noise from the surface facilities at the Bowie No. 2 Mine would be blocked by a pronounced ridge west of the facility.

#### **Noise Impacts from Train Loading Operations**

Noise readings conducted on October 29, 1999 by Air Sciences, Inc. (under contract to Oxbow) at the Oxbow train loading facility at Somerset indicated that the train loading operation complied with Colorado noise statutes. Noise readings taken on Garvin Mesa near the Bowie No. 1 Loadout showed that the facility also complies with the Colorado noise statutes at the facility boundary.

#### **Noise Impacts from Train Whistles**

Whistles blown an estimated 100 feet from the public crossing would be expected to exceed noise levels of 100 dBA. Train whistles sounded at night would exceed the Colorado statutes that limit noise level to 75 dBA at the edge of the railroad right-of-way. The whistle is clearly audible above the quiet background, as intended by federal regulation.

#### **Noise Impacts from Coal Trains**

Train noise varies considerably depending on the speed of the train, the distance from the track, and the presence of buildings between the tracks and the receiver. Generally, noise from a fast-moving train would be much higher than noise from a slow-moving train. With regard to passing train noise, the following generalizations are made:

- Homes near the railroad tracks without intervening buildings between them and the tracks

would be subject to a severe impact.

- Homes more than about one block from the railroad tracks that are partially shielded by adjacent buildings would be subjected to noise levels above non-train background levels, but the noise levels would not be considered severe.
- Homes more than about two blocks from the railroad tracks that are shielded by intervening buildings would perceive noise levels during the daytime that would be only slightly higher than the background levels.

Although the noise from passing trains would be audible during quiet nighttime periods, the noise of passing trains would not be expected to disrupt sleep or normal speech of individuals living more than two blocks from the railroad tracks under most conditions.

#### **3.35.2 Cumulative Impacts**

Noise from the surface facilities of the Bowie Mine No. 2 would not be expected to add cumulatively to noise nuisance impacts. However, the transportation of coal from the West Elk Mine would add cumulative noise nuisance impacts. The principal cause would be from the rail transport of coal from the underground mine operation east of Somerset, as coal trains shipping with West Elk Coal pass through the communities of Somerset, Paonia, Hotchkiss, and Delta.

#### **3.35.3 Conditions of Approval**

No conditions of approval regarding noise are recommended.

### **3.35.4 Consistency with Forest Plan and Other Laws**

The GMUG Amended Land and Resource Management Plan (Forest Plan), dated September 1991, and the BLM Uncompahgre Basin Resource Management Plan (RMP), dated July 1989, made provisions for coal leasing subject to the application of the coal unsuitability criteria established in 43 CFR 3461.

### **3.36 Short-term Uses and Long-term Productivity**

NEPA requires consideration of “the relationship between short-term uses of man’s environment and the maintenance and enhancement of long-term productivity” (40 CFR 1502.16). As declared by the Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

See discussions of environmental consequences in this chapter.

### **3.37 Unavoidable Adverse Effects**

For the Proposed Action, subsidence is unavoidable if coal is mined. See Topography and Geology Sections for details.

### **3.38 Irreversible and Irretrievable Commitments of Resources**

Irreversible commitments of resources are those that cannot be regained. In this case the removal of mined coal is an irreversible commitment of resources. Irretrievable commitments are those that are lost for a period of time. In this case the temporary loss of vegetative productivity/cover where subsidence occurs is irretrievable commitment of resources.

Soil loss due to erosion and reduced productivity in areas of surface disturbance are likely to be irreversible and irretrievable. Landslides or other mass movement, are difficult to fully reclaim and may result in permanent landscape features.

Mitigation measures required by the Colorado CDMG mining permit will reduce, but not eliminate these adverse impacts.

- Heritage Resources

Any disturbance of cultural sites could result in an irreversible commitment. However, research values could be recovered prior to any physical loss. Cultural resources are not known to occur in lease modification area.

- Vegetation

Any vegetation removed in the areas of the RFMP would result in an irretrievable resources commitment. These areas would eventually revegetation, so the commitment is not irreversible.



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### Distribution of the Environmental Assessment

This Environmental Assessment will be distributed to individuals who specifically requested a copy of the document and/or commented during scoping. It will also be made available electronically at:

<http://www.fs.fed.us/r2/gmug/policy/>



## REFERENCES

### Air Quality

*Deer Creek Shaft and E Seam Methane Drainage Wells Project FEIS*. 2007. Air Quality Section, Pg 56-62. [http://www.fs.fed.us/r2/gmug/policy/minerals/deer\\_creek/Deer\\_Ck\\_Shaft\\_and\\_E\\_Seam\\_MDW\\_Project\\_FEISr2.pdf](http://www.fs.fed.us/r2/gmug/policy/minerals/deer_creek/Deer_Ck_Shaft_and_E_Seam_MDW_Project_FEISr2.pdf)

CAPCC. 2006. Colorado Department of Public Health and Environment, Air Pollution Control Commission website <http://www.cdphs.state.co.us/regulations/airregs/index.html>

FP-03, U.S. Customary Units. 2003. *Standard Specification for Construction of Roads and Bridges and Federal Highway Projects*, FP-03, U.S. Customary Units. Table 703-3. Pg 602.

USEPA, 1999. United States Environmental Protection Agency website. NATIONAL AIR QUALITY AND EMISSIONS TRENDS REPORT, 1999

<http://www.epa.gov/air/airtrends/aqtrnd99/pdfs/Chapter2a.pdf>

USEPA, 2006a. United States Environmental Protection Agency website <http://www.epa.gov/air/data/>

USEPA, 2006b. United States Environmental Protection Agency website <http://www.epa.gov/libraries/core/envlaw.htm>

USEPA, 2006c. United States Environmental Protection Agency website

<http://www.epa.gov/ttn/chief/ap42/>

USEPA, July 2007. United States Environmental Protection Agency

website

<http://www.epa.gov/otaq/inventory/overview/pollutants/nox.htm#onroad>

EIA, November 2007. Energy Information Administration <http://www.eia.doe.gov/oiaf/1605/ggrpt/index.html#intensity>

### General

USDA FS 2000. ROD/FEIS "North Fork Coal EIS", Iron Point Coal Exploration License (COC-61945) and Iron Point Coal Lease License (COC-61209)

USDA FS 2002. Decision Notice and Finding of No Signification Impact, Modification of Iron Point Coal Exploration License (COCO-61945), and Gob Ventilation Borehole Installation of Iron Point Federal Coal Lease (COC-61209).

USDA FS 2002. Alder Creek Coal Exploration License (COC-66126).

USDA FS 2004. Iron Point Gulch Exploration License (COC-67703).

USDA FS 2005. Spruce Stomp Coal Exploration License (COC-67644).

USDA FS 2006. USDA FS, Decision Notice and Finding of No Signification Impact, Terror Creek 2D Seismic Plan (COC-69307).

USDA FS 2006. Iron Point Gulch Exploration License (COC-70127).

USDA FS 2007. Decision Memo, Bowie Resources Geotechnical Borehole (Hubbard Creek).

USDA FS 2007. Decision Memo, Bowie Resources Hubbard Creek Ventilation / Emergency Escape Shaft.

USDA FS 2008. COC-61209, Thirteen Gob-vent Boreholes (TR-52).

2008. Spruce Stomp Coal Exploration License (COC-72069).

2008. Jeep Trail Coal Exploration License (COC-72168).

## Hydrology

BRL 2007. 2007 Annual Hydrology Report, Annual Subsidence Report, Annual Mine Inflow Report

### Mining/Geology

Agapito and Associates, Inc. 2005. Dry Fork Federal Coal Lease by Application Subsidence Evaluation. Completed for the USDA Forest Service, Gunnison National Forest. Agapito Associates, Inc. December 2004.

Makeki Technologies, Inc, 2007, Prediction of Surface Deformation Resulting from Longwall Mining in the Dove Gulch Area for the New Layout

## Sensitive and MIS Species

Braun, C.E., J.H. Enderson, M.R. Fuller, Y.B. Linhart and C.D. Marti. 1996. Northern Goshawks and Forest Management in the Southwestern United States. Wildl. Soc. Tech. Rev. 96-2. pg 9.

Colorado Herpetological Society. 2008. <http://Coloherp.org/geo>

CDOW (Colorado Division of Wildlife). 2008. Recommended Buffer Zones and Seasonal Restrictions for Colorado Raptors.

CDOW (Colorado Division of Wildlife). 2007. 2005 Elk Harvest Summaries. <http://wildlife.state.co.us/NR/rdonlyres/7>

[828FA0B-D87C-4CDF-A7F1-1F178E7B285D/0/2005Elkharvest.pdf](http://wildlife.state.co.us/NR/rdonlyres/828FA0B-D87C-4CDF-A7F1-1F178E7B285D/0/2005Elkharvest.pdf)

CDOW. 2008. 2007 Elk Harvest Summaries.

<http://wildlife.state.co.us/NR/rdonlyres/EF5A0F6C-FB96-4B25-AC47-8643ED887FFF/0/2007StatewideElkHarvest.pdf>

CDOW. 2008a. 2006 Elk Post Hunt Population Estimates.

<http://wildlife.state.co.us/NR/rdonlyres/1E25665D-6588-49DE-A45C-5CB79A50C8E4/0/2006posthuntElkpopulationestimates.pdf>

Edge, W.D. and C.L. Marcum. 1985. Movements of elk in relation to logging disturbances. *Journal of Wildlife Management* 49(4): 926-930.

Fitzgerald, J.P., C.A. Meaney and D.M. Armstrong. 1994. *Mammals of Colorado*. University Press of Colorado. Niwot, CO. pgs. 81-82

Fowler, Mike. 2007. Big Game Herd Populations. *Colorado Outdoors*. Volume 56, No. 1. pp. 28-31.

Gunther, K.A., M.J. Biel and H.L. Robison. 1998. Factors Influencing the Frequency of Road-killed Wildlife in Yellowstone National Park. In Evink G.L., P.Garrett, D. Zeigler and J. Berry eds. 1998. *Proceedings of the International Conference on Wildlife Ecology and Transportation*. FL-ER-69-98. Florida Department of Transportation, Tallahassee, FL. Pgs 32-42.

Hammerson, G.A. 1999. *Amphibians and Reptiles in Colorado, a Colorado Field Guide*. Second Edition. University Press of Colorado, Niwot, CO. pgs 82-85, 90-98, 145-151, 375-386,



Hayward, G.D. and J. Verner, Technical Editors. 1994. Flammulated, Boreal, and Great Gray Owls in the United States: A Technical Conservation Assessment. GTR-RM-253. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. Pgs. 41, 119.

Hillis, J.M., M.J. Thompson, J.E. Canfield, L.J. Lyon, C.L. Marcum, P.M. Dolan and D.W. McCleerey. 1991. Defining Elk Security: the Hillis paradigm. Elk Vulnerability Symposium, Montana State University, Bozeman, MT. April 10-12, 1991. pgs 38-43.

Hoover, R.L. and D.L. Wills, eds. 1984. Managing Forested Lands for Wildlife. Colorado Division of Wildlife in cooperation with USDA Forest Service, Rocky Mountain Region, Denver, CO. 46-50, 58-60.

Kennedy, P.L. (2003, January 2). Northern Goshawk (*Accipiter gentiles atricapillus*): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: <http://www.fs.fed.us/r2/projects/scp/assessments/northerngoshawk.pdf>

Kingery, H.E. ed. 1998. Colorado Breeding Bird Atlas. Colorado Bird Atlas Partnership and Colorado Division of Wildlife. Denver, CO. Pgs 210-211, 228-229, 236-237.

Loeffler, C. (ed), 2001. Conservation plan and agreement for the management and recovery of the southern Rocky Mountain population of the boreal toad (*Bufo boreas boreas*), Boreal Toad Recovery Team. 76 pp + appendices.

Lyon, L.J. 1979. Habitat Effectiveness for Elk as Influenced by Roads and Cover. Journal of Forestry. October 1979. p 658-660.

Monarch and Associates and Michael Ward Outdoors. 2005. Oxbow Mine, LLC Elk Creek Mine Block Clearance Report.

Mueggler, W.F. 1985. Vegetation Associations in Aspen: Ecology and Management in the Western United States, DeByle and Winokur, eds. General Technical Report RM-GTR-119. Ogden, Utah: USDA Forest Service, Rocky Mountain Research Station. Pg. 45

Phillips, G.E. and A.W. Alldredge. 2000. Reproductive success of elk following disturbance by humans during calving season. Journal of Wildlife Management 64(2): 521-530.

Ptacek, J.A., D.E. Rees, and W.J. Miller. (2005, April 25). Bluehead sucker (*Catostomus discobolus*): a technical conservation assessment. [Online] USDA Forest Service, Rocky Mountain Region. Available: <http://www.fs.fed.us/r2/projects/scp/assessments/blueheadsucker.pdf>

Reynolds, R.T., R.T. Graham, M.H. Reiser, R.L. Bassett, P.L. Kennedy, D.A. Boyce, G. Goodwin, R. Smith, and E.L. Fisher. 1992. Management Recommendations for the Northern Goshawk in the Southwestern United States.

Rowland, M.M., M.J. Wisdom, B.K. Johnson and J.G. Kie. 2000. Elk distribution and modeling in relation to roads. Journal of Wildlife Management 64(3): 672-684.

Sauer, J. R., J. E. Hines, and J. Fallon. 2007. *The North American Breeding Bird Survey, Results and Analysis 1966 - 2006. Version 10.13.2007.* USGS Patuxent Wildlife Research Center, Laurel, MD

USDA Forest Service 2008. Rocky Mountain Region Threatened, Endangered, Proposed, and Sensitive Species  
[http://fsweb.r2.fs.fed.us/rr/R2\\_TES\\_Site\\_2007/sensitive/matrices/r2\\_tes\\_by\\_unit\\_matrix.doc](http://fsweb.r2.fs.fed.us/rr/R2_TES_Site_2007/sensitive/matrices/r2_tes_by_unit_matrix.doc) 04 February 2008.

USDA Forest Service, 2008a. Region 2 Regional Forester's Sensitive Species List.  
<http://www.fs.fed.us/r2/projects/scp/sensitive-species/index.shtml>

USDA Forest Service, 2008b. Region 2 Species Conservation Assessments.  
<http://www.fs.fed.us/r2/projects/scp/assessments/index.shtml>

USDA Forest Service. 2005a. Sensitive Species Evaluation Forms.  
[www.fs.fed.us/r2/projects/scp](http://www.fs.fed.us/r2/projects/scp).

USDA Forest Service 2005b. Rocky Mountain Elk (*Cervus elaphus nelsoni*) Species Assessment Draft. Grand Mesa, Uncompahgre, and Gunnison National Forests. Delta, CO.

USDA Forest Service 2005c. Environmental Assessment, Management Indicator Species, forest Plan Amendment to the LRMP for the Grand Mesa, Uncompahgre, and Gunnison National Forests. March, 2005. Delta, CO.

USDA Forest Service 2005d. Merriam's Turkey (*Meleagris gallapovo merriami*) Species Assessment. Grand Mesa,

Uncompahgre, and Gunnison National Forests. Delta, CO.

USDA Forest Service 2005e. Red-naped Sapsucker (*Sphyrapicus nuchalis*) Species Assessment. Grand Mesa, Uncompahgre, and Gunnison National Forests. Delta, CO.

USDA Forest Service 2005f. Northern Goshawk (*Accipiter gentilis*) Species Assessment. Grand Mesa, Uncompahgre, and Gunnison National Forests. Delta, CO.

USDA Forest Service 2001. Biological Assessment and Evaluation. Iron Point Coal Exploration License Area, Iron Point Coal Lease Tract. Delta, CO.

USDA Forest Service, 2001a. Management Indicator Species Assessment, Grand Mesa, Uncompahgre, and Gunnison National Forests. Delta, CO.

USDA Forest Service. 1994. Habitat Capability Model, Rocky Mountain Region, Documentation and Users Guide. USDA Forest Service, Rocky Mountain Region, Renewable Resources, Lakewood, CO. p 4-6.

USDA Forest Service. 1991. Amended Land and Resource Management Plan, Grand Mesa, Uncompahgre, and Gunnison National Forests. Delta, CO.

USDI Fish and Wildlife Service, 2005. Revised 12-month finding for the Southern Rocky Mountain Distinct Population Segment of the Boreal Toad (*Bufo boreas boreas*). Washington, D.C. Federal Register. Volume 70, Number 188: pages 56680 – 56684.

Wiggins, D. (2005, March 31). Purple Martin (*Progne subis*): a technical

conservation assessment. [Online].  
USDA Forest Service, Rocky Mountain  
Region. Available:  
<http://www.fs.fed.us/r2/projects/scp/assessments/purplemartin.pdf>

## Threatened and Endangered Species

CDOW (Colorado Division of Wildlife).  
2005. General Locations of Lynx (Lynx  
Canadensis) Reintroduced to  
Southwestern Colorado from February 4,  
1999 through February 1, 2005.  
<http://wildlife.state.co.us/NR/rdonlyres/F92E6FCD-BCB5-4711-8EE6-A9398EA77999/0/LynxLocationsFeb2005.pdf>

CDOW. 2005a. Lynx Update, August  
15, 2005.  
<http://www.utahwolf.net/assets/Aug1505Lynxfullupdate.pdf>

CDOW. 2006. Lynx Update,  
November 8, 2006.  
<http://wildlife.state.co.us/NR/rdonlyres/56F725F1-39DD-45E2-8F6F-5EE51AD03E2F/0/LynxUpdateNov92006.pdf>

CDOW. 2007. Lynx Update,  
September 6, 2007.  
<http://wildlife.state.co.us/NR/rdonlyres/56F725F1-39DD-45E2-8F6F-5EE51AD03E2F/0/LynxUpdateSep62007.pdf>

Gunther, K.A., M.J. Biel and H.L.  
Robison. 1998. Factors Influencing the  
Frequency of Road-killed Wildlife in  
Yellowstone National Park. In Evink  
G.L., P.Garrett, D. Zeigler and J. Berry  
eds. 1998. Proceedings of the  
International Conference on Wildlife  
Ecology and Transportation. FL-ER-69-  
98. Florida Department of

Transportation, Tallahassee, FL. Pgs 32-  
42.

Ruediger, B. et al. 2000. Canada Lynx  
Conservation Assessment and Strategy.  
2<sup>nd</sup> Edition. USDA Forest Service, USDI  
Fish and Wildlife Service, USDI Bureau  
of Land Management, and USDI  
National Park Service. Forest Service  
Publication #R1-00-53, Missoula, MT.  
pgs 1-3, 1-10, 1-11, 1-13.

Ruggiero, L.F., K.B. Aubry, S.W. Buskirk  
and others. 2000. Ecology and  
Conservation of Lynx in the United  
States. University Press of Colorado,  
Boulder, CO. pgs 122, 183-191

Ruggiero, L.F., K.B. Aubry, S.W.  
Buskirk, L.J. Lyon and W.J. Zielinski.  
1994. The Scientific Basis for  
Conserving American Marten, Fisher,  
Lynx and Wolverine in the Western  
United States. General Technical Report  
RM-254. Ft. Collins, CO. USDA Forest  
Service, Rocky Mountain Forest and  
Range Experiment Station. Pgs 8, 24-27,  
114-115.

USDA Forest Service, 1991. Amended  
Land and Resource Management Plan,  
Grand Mesa, Uncompahgre, and  
Gunnison National Forests. Delta, CO.

Sidle R. C., I. Kamel, A. Shurma and S.  
Yamashita, 2000. Stream response to  
subsidence from underground coal  
mining in central Utah. Journal of  
Environmental Geology. Volume 39,  
No. 3-4.

USDA Forest Service. 2005. Canada  
Lynx Conservation Agreement; US  
Forest Service and US Fish and Wildlife  
Service. USFS Agreement #00-MU-  
11015600-013.

USDI Fish and Wildlife Service. 2005. Recovery Outline; Contiguous United States Distinct Population Segment of the Canada Lynx, 9/14/05. USFWS, Helena, Montana. 21pp.

USDI Fish and Wildlife Service. 2005a. Proposed Designation of Critical Habitat for the Contiguous United States Distinct Population Segment of the Canada Lynx; Proposed Rule. Federal Register, Vol. 70, No. 216, 68294-68328.

USDI Fish and Wildlife Service. 2006. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Contiguous United States Distinct Population Segment of the Canada Lynx; Final Rule. Federal Register, Vol. 71, No. 217, 66008-66061.

USDI Fish and Wildlife Service. 2008. Current species lists for Colorado counties. February 19.

# APPENDIX A- UNSUITABILITY ANALYSIS AND REPORT FEDERAL COAL LEASE MODIFICATION COC-61209, MODIFICATION 4

## DESCRIPTION OF THE FEDERAL LANDS INVOLVED

This unsuitability analysis and report has been prepared to comply with regulations at 43 CFR 3461 for Federal Coal Lease Modification COC-61209 Mod 4, 560 acres of federal coal lands described as:

T. 12S., R. 91 W., 6th Principal Meridian,  
Sec. 27, SW1/4, S1/2SE1/4, S1/2NE1/4SE1/4, S1/2NW1/4SE1/4;  
Sec. 28, E1/2SE1/4  
Sec. 33, Ne1/4NE1/4  
Sec. 34, N1/2N1/2

This lease modification application was brought forward by Bowie Resources, Ltd. (BRL) to compensate for changes in mine design, which were driven by underground hazards associated with local geology which resulted in hazardous mining conditions. The modification lies immediately north, and is contiguous with federal coal lease COC-61209. The coal in this lease modification would be accessed and recovered by underground longwall mining methods from BRLs existing Bowie No. 2 Mine. The surface of the lease modification is National Forest System (NFS) lands administered by the Grand Mesa-Uncompahgre-Gunnison National Forests (GMUG). The mineral estate is federally owned and is administered by the BLM-Uncompahgre Field Office.

As a first step in this analysis, the preliminary mining plan submitted by the applicant was examined in order to identify areas in which the proposed underground mining operation would produce surface effects, including where the zone of influence from subsidence may extend beyond the lease modification boundaries. Areas identified as likely to be affected by subsidence were delineated as having surface effects. For this lease modification the zone of influence was assessed to lie inside the outer boundaries of the modification area.

This analysis and report was prepared consistent with the unsuitability criteria published in 43 CFR 3461. The unsuitability criteria were applied individually to the area being considered, and areas identified as having surface effects as applicable. Each criterion was applied individually, then after all criteria had been applied, the exemptions of each criterion found to be applicable were then examined; thirdly a determination was made if the exceptions to each criteria were applicable. Exceptions to certain criteria allow areas to be considered further even though they have been determined to be unsuitable. These exceptions to the criteria are noted where applied.

## ANALYSIS OF THE UNSUITABILITY CRITERIA

The analysis examined the applicability of exemptions and exceptions to the criteria as detailed in regulation. Exemptions to the criteria are not described, as no exemptions were determined to apply. Exceptions to the criteria are described only if they apply.

### Criterion 1

All Federal lands included in the following land systems or categories shall be considered unsuitable: National Park System, National Wildlife Refuge System, National System of Trails, National Wilderness Preservation System, National Wild and Scenic Rivers System, National Recreation Areas, lands acquired with money derived from the Land and Water Conservation Fund, National Forests, and federal lands in incorporated cities, towns, and villages.

1. Exceptions.(i) A lease may be issued within the boundaries of any National Forest if the Secretary finds no significant recreational, timber, economic or other values which may be incompatible with the lease; and (A) surface operations and impacts are incident to an underground coal mine, or (B) where the Secretary of Agriculture determines, with respect to lands which do not have significant forest cover within those National Forests west of the Meridian, that surface mining may be in compliance with the Multiple-Use Sustained-Yield Act of 1960, the Federal Coal Leasing Amendments Act of 1976 and the Surface Mining Control and Reclamation Act of 1977.

#### Analysis

The lands described in this lease modification were proclaimed National Forest on June 5, 1905 and are within the Gunnison National Forest. Management direction for coal resources are listed in the Amended Land and Resource Management Plan (LRMP), Grand Mesa, Uncompahgre and Gunnison National Forests - General Direction on pages III-62 through III-70.

The LRMP allows for multiple use management on the lands in the lease modification, which are principally managed for wildlife habitat, however management includes livestock grazing, motorized recreation and vegetation treatment. The LRMP does not identify that any significant recreational, timber, economic or other values which may be incompatible with the lease are present. No significant forest cover is present.

In addition, foreseeable surface operations and impacts will be incident to an underground coal mine. Therefore, for reasons stated above, the exception can apply to this criterion.

#### Criterion 2

Federal lands that are within rights-of-way or easements or within surface leases for residential, commercial, industrial, or other public purposes, on federally-owned surface shall be considered unsuitable.

1. Exceptions. A lease may be issued, and mining operations approved, in such areas if the surface management agency determines that (i) all or certain types of coal development (e.g., underground mining) will not interfere with the purpose of the right-of-way or easement, or (ii) the right-of-way or easement was granted for mining purposes, or (iii) the right-of-way or easement was issued for a purpose for which it is not being used, or (iv) the parties involved in the right-of-way or easement agree, in writing, to leasing, or (v) it is impractical to exclude such areas due to the location of coal and method of mining and such areas or uses can be protected through appropriate stipulations.

### Analysis

There is a General Land Office Order, 10/31/1973, which classifies the lands within the application area for coal. The lands are also within the Paonia-Somerset Known Recoverable Resource Area, COC-20093. There are no rights-of-way, easements or surface leases for residential, commercial, industrial, or other public purposes within the review area.

### Criterion 3

Federal lands affected by section 522(e)(4) and (5) of the Surface Mining Control and Reclamation Act of 1977 shall be considered unsuitable. This includes lands within 100 feet of the outside line of the right-of-way of a public road, or within 100 feet of a cemetery, or within 300 feet of any public building, school, church, community or institutional building or public park, or within 300 feet of an occupied dwelling.

1. Exceptions. A lease may be issued for lands (i) used as mine access roads or haulage roads that join the right-of-way for a public road, (ii) for which the Office of Surface Mining Reclamation and Enforcement has issued a permit to have public roads relocated, (iii) if, after public notice and opportunity for public hearing in the locality, a written finding is made by the Authorized Officer that the interests of the public and the landowners affected by mining within 100 feet of a public road will be protected, or (iv) for which owners of occupied dwellings have given written permission to mine within 300 feet of their buildings.

### Analysis

No public roads, cemeteries, occupied dwellings, public buildings, schools, churches, community, or institutional buildings exist within this area.

### Criterion 4

Federal lands designated as wilderness study areas shall be considered unsuitable while under review by the Administration and Congress for possible wilderness designation. For any federal land which is to be leased or mined prior to completion of the wilderness inventory by the surface management agency, the environmental assessment or impact statement on the lease sale or mine plan shall consider whether the land possesses the characteristics of a wilderness study area. If the finding is affirmative, the land shall be considered unsuitable, unless issuance of noncompetitive coal leases and mining on leases is authorized under the Wilderness Act and the Federal Land Policy and Management Act of 1976.

### Analysis

No lands within the review area are designated Wilderness Study Areas. The current LRMP manages these lands for multiple uses (see Criterion 1). Wilderness characteristics for these lands were evaluated by the GMUG in 2005. These lands did not meet the criteria for roadless character, or wilderness characteristics.

Criterion 5

Scenic federal lands designated by visual resource management analysis as Class I (an area of outstanding scenic quality or high visual sensitivity) but not currently on the National Register of Natural Landmarks shall be considered unsuitable. A lease may be issued if the surface management agency determines that surface coal mining operations will not significantly diminish or adversely affect the scenic quality of the designated area.

Analysis

No lands within the review area are designated as visual resource management Class I areas.

Criterion 6

Federal lands under permit by the surface management agency, and being used for scientific studies involving food or fiber production, natural resources, or technology demonstrations and experiments shall be considered unsuitable for the duration of the study, demonstration, or experiment except where mining could be conducted in such a way as to enhance or not jeopardize the purposes of the study, as determined by the surface management agency, or where the principal scientific use or agency give written concurrence to all or certain methods of mining.

Analysis

No lands within the review area are under permit for scientific study.

Criterion 7

All publicly-owned places on federal lands which are included in the National Register of Historic Places shall be considered unsuitable. This shall include any areas that the surface management agency determines, after consultation with the Advisory Council on Historic Preservation and the State Historic Preservation Officer, are necessary to protect the inherent values of the property that made it eligible for listing in the National Register.

Analysis

No publicly-owned places on federal or fee lands within the review area are included in the National Register of Historic Places.

Criterion 8

Federal lands designated as natural areas or as National Natural Landmarks shall be considered unsuitable.

Analysis

No lands within the review area are designated as natural areas or as National Natural Landmarks.

Criterion 9

Federally designated critical habitat for listed threatened or endangered plant and animal species, and habitat proposed to be designated as critical for listed threatened or endangered plant and animal species or species proposed for listing, and habitat for Federal threatened or endangered species which is determined by the Fish and Wildlife Service (Service) and the surface management agency to be of essential value and where the presence of threatened or endangered species has been scientifically documented, shall be considered unsuitable.



1. Exceptions. A lease may be issued and mining operations approved if, after consultation with the Fish and Wildlife Service, the Service determines that the proposed activity is not likely to jeopardize the continued existence of the listed species and/or its critical habitat.

Analysis

No lands within the review area are designated as critical habitat, proposed to be designated as critical habitat, or determined to be essential habitat for any Federally listed threatened or endangered plant or animal species, or species proposed for listing (Federal Register, various dates).

A county-by-county species list was provided by the US Fish and Wildlife Service in February 2008. There is only two federally listed species that has the potential to be found in the project area, the *Canada lynx* and the *Greenback cutthroat trout*. Other species considered are shown in the following table.

**Federally Threatened and Endangered or Candidate Species considered in the Lease Modification Area.**

| <b>Species</b>                    | <b>Scientific Name</b>        | <b>Impact ed by project ?</b> | <b>Habitat Requirements</b>   | <b>Description and</b> |
|-----------------------------------|-------------------------------|-------------------------------|---|------------------------|
| Canada Lynx                       | <i>Lynx canadensis</i>        | No                            | Spruce/fir, mixed conifer, lodgepole pine forest (primary), or mixed deciduous/conifer (secondary)  |                        |
| Black-footed ferret               | <i>Mustela nigripes</i>       | No                            | Coincident with prairie dogs, its primary prey. Not known or expected to occur on the GMUG.   |                        |
| Yellow-billed cuckoo* (Candidate) | <i>Coccyzus americanus</i>    | No                            | Low elevation river corridors, cottonwoods  |                        |
| Clay-loving wild buckwheat        | <i>Erigonium pelinophilum</i> | No                            | Specific microhabitats along toe slopes in adobe soils of Mancos shale in sage and shadscale near 5270' elevation. Not known or expected to occur in the project area.                            |                        |
| Uinta Basin Hookless Cactus       | <i>Sclerocactus glaucus</i>   | No                            | Grows on fine-textured soils derived from Mancos shale in shadscale, greasewood and juniper community types at elevations generally near 5,000 ft. No known or expected to occur on the district. |                        |
| Bonytail chub                     | <i>Gila elegans</i>           | Yes                           | Colorado and Gunnison Rivers  |                        |
| Razorback sucker                  | <i>Xyrauchen texanus</i>      | Yes                           | Colorado and Gunnison Rivers  |                        |

|                           |                                    |     |                              |
|---------------------------|------------------------------------|-----|------------------------------|
| Humpback chub             | <i>Gila cypha</i>                  | Yes | Colorado and Gunnison Rivers |
| Colorado pikeminnow       | <i>Ptychocheilus lucius</i>        | Yes | Colorado and Gunnison Rivers |
| Greenback cutthroat trout | <i>Oncorhynchus stomias clarki</i> | No  | Hubbard Creek                |

The Canada Lynx was listed as threatened in March 2000. In August 2004, the Second Edition of the Canada Lynx Conservation Assessment and Strategy (LCAS) was released, to provide a consistent and effective approach to conserve Canada lynx on federal lands. The Canada Lynx Conservation Agreement (USDA 2005) identifies the Science Report (Ruggerio et al. 2000) and the LCAS (Ruediger et al. 2000) as including the best available science on habitat and conservation measures. Both of these documents, along with local information are used for project analyses.

Following release of the LCAS, the Forest mapped lynx analysis units (LAUs) and habitat within them, based on Regional direction. Habitat was mapped based on existing vegetation information, including vegetation type, canopy closure and size of trees. Areas outside of LAUs are not considered to be lynx habitat, even though they may contain habitat components or stands similar to those within LAUs. Approximately 2.8 acres of the new lease modification area is within the Crater Lake LAU. Effects to that landscape are anticipated to be limited to subsidence from underground mining activities. Implementation of the project **will have no effect** on the lynx. Any potential effects are insignificant and discountable due to the distance of the project from suitable denning habitat, the lack of suitable habitat alteration, and the low probability of loss of lynx from traffic or shooting as a result of this project.

Implementation of the project **may affect, and is likely to adversely affect**, the bonytail, Colorado pikeminnow, the humpback chub, and the razorback sucker, due to the cumulative nature of water depletions associated with this and other activities in the area. Critical habitat for the Colorado-pikeminnow, razorback sucker, humpback chub, and bonytail chub does exist off-site in the lower Gunnison River, and in the Colorado River. This critical habitat could be affected by water depletion from this action (Federal Register/Vol. 59, No. 54). This project **may affect, and is likely to adversely affect**, designated critical habitat for these species downstream of this project.

Portions of Hubbard Creek are suitable habitat for Greenback cutthroat trout. The areas has not been designated as essential or critical habitat for greenback trout. Greenback cutthroat trout have not been collected in the project area but have been documented upstream un upper Hubbard Creek, the proposed action and associated subsidence will have **"no effect"** on Greenback trout populations.

Water depletion associated with this project would be consistent with the programmatic document developed for small water depletions (< 100 acre-feet per year) associated with numerous mineral development projects located on the GMUG NF (USFWS May 25, 2005, amended April 27, 2007 - #ES/GJ-6\_CO-99-F-033-CP062). At the post-leasing (permitting) stage, prior to the approval of the mine plan, if it is determined that development of the lease would result in a change in water use resulting in a surface water depletion in the upper Colorado River Basin that exceeds the quantity covered in the existing programmatic opinion, the permitting agency must enter into consultation with the U.S. Fish and Wildlife Service to determine the appropriate conservation measures to offset the effect to these listed fishes.

### **Specific Protections Endangered Colorado River Fish:**

1. In the future, if water used for mine related activities exceeds a depletion amount previously consulted upon by the GMUG, the permitting agency must enter into consultation with the U.S. Fish and Wildlife Service to determine appropriate conservation measures to offset effects to listed fish and critical habitat in the upper Colorado River Basin.

Therefore for reasons stated above, the exception can apply to this criterion.

### Criterion 10

Federal lands containing habitat determined to be critical or essential for plant or animal species listed by a state pursuant to state law as endangered or threatened shall be considered unsuitable.

1. Exceptions. A lease may be issued and mining operations approved if, after consultation with the state, the surface management agency determines that the species will not be adversely affected by all or certain stipulated methods of coal mining.

### Analysis

There is habitat within the lease modification area for the boreal toad, the greenback cutthroat trout, and the Canada Lynx.

The boreal toad may occur in this area but has not been located here. Breeding habitat for boreal toads consists of marsh, pond, bog, or wet meadow habitat in spruce-fir forests or alpine meadows, at elevations above 8,000 feet (Boreal Toad Recovery Plan, 1994). The lease modification area is generally devoid of water, consists of step slopes, the majority of which is at elevations under 8,000 feet. No known boreal toad habitat exists on the proposed lease modification. Implementation of the proposed action "may impact individuals or habitat, but will not likely contribute to a trend towards federal listing" of the boreal toad. As there are no known or suspected populations of this species in this area, impacts are unlikely, but potential impacts to this species, if it does occur in this area, do exist. However, the magnitude of potential impacts are slight due to standard mitigation measures (BMPs) implemented for these types of projects.

Portions of Hubbard Creek is suitable habitat for Greenback cutthroat trout. The areas has not been designated as essential or critical habitat for greenback trout. Greenback cutthroat trout have not been collected in the project area but have been documented upstream un upper Hubbard Creek, the proposed action and associated subsidence will have "**no effect**" on Greenback trout populations.

Portions of the lease modification area are within a mapped Lynx Analysis Unit, but none of the area is suitable lynx habitat.

Therefore, for reasons stated above, the exception can apply to this criterion.

### Criterion 11

A bald or golden eagle nest site on federal lands that is determined to be active, and an appropriate buffer zone of land around the nest site shall be considered unsuitable. Consideration of availability of habitat for prey species and of terrain shall be included in the determination of buffer zones. Buffer zones shall be determined in consultation with the Fish and Wildlife Service.

1. Exceptions. A lease may be issued if (1) it can be conditioned in such a way, either in manner or period of operation, that eagles will not be disturbed during the breeding season, or (2) the surface management agency, with the concurrence of the Fish and Wildlife Service, determines that the golden eagle nest(s) will be moved, or (3) buffer zones may be decreased if the surface management agency determines that the active eagle nests will not be adversely affected.

Analysis

There is a known golden eagle nest near Terror Reservoir. This site will need to be monitored for activity. Due to the distance of the area from suitable foraging habitat (the North Fork Gunnison) it is unlikely that bald eagles nest in this area.

Underground coal mining and nesting bald or golden eagles are compatible on the same tract of land unless surface facilities or surface disturbances cause nest-site abandonment. Present guidelines used by the CDOW are:

Golden Eagle:

|   |
|---|
| No surface occupancy beyond historic levels within ¼ mile radius of active golden eagle nests. (CDOW 2008)                    |
| Seasonal restriction to human encroachment within ½ mile radius of active nests from December 15 through July 15. (CDOW 2008) |

Any proposed surface facilities, disturbances or activities (as noted above) in or adjacent to these buffer zones will require approval from the surface management agency (BLM or USFS) on a site-specific basis, after consultation with the Fish and Wildlife Service.

Stipulations on the existing lease, which will apply to the modification area, are consistent and/or more restrictive than the current DOW language.

Therefore, for reasons stated above, the exception can apply to this criterion.

Criterion 12

Bald and golden eagle roost and concentration areas on federal lands used during migration and wintering shall be considered unsuitable.

Analysis

No bald or golden eagle roost sites or concentrations areas are known to exist on federal lands within the review area.

Criterion 13

Federal lands containing a falcon (excluding kestrel) cliff nesting site with an active nest and buffer zone of federal land around the nest site shall be considered unsuitable. Consideration of availability of habitat for prey species and of terrain shall be included in the determination of buffer zones. Buffer zones shall be determined in consultation with the Fish and Wildlife Service.

1. Exception. A lease may be issued where the surface management agency, after consultation with the Fish and Wildlife Service, determines that all or certain

stipulated methods of coal mining will not adversely affect the falcon habitat during the periods when such habitat is used by the falcons.

#### Analysis

There are no known peregrine or prairie falcon nest sites in the lease modification area. However, suitable nesting cliffs exist in the area, and surveys for peregrines will need to occur in this area. Lease stipulations on the parent lease require raptor surveys:

- Conduct surveys for nesting raptors on the lease tract prior to development of any surface facilities. No surface activities will be allowed within ½ mile rates of active nest sites between the dates of February 1 and August 15, unless authorized by the BLM or USFS on a site specific basis.

These stipulations will apply to the lease modification area.

Implementation of the proposed action “may impact individuals or habitat, but will not likely contribute to a trend towards federal listing”. This is based on the presence of potential nest locations in or near the project area, and the low potential for disturbance as a result of pre-disturbance surveys and implementation of conditions for surface use if needed. As similar sites exist throughout the Hubbard Canyon and North Fork Valley, and this species is not known to use this area, the potential for harmful effects at the population level is anticipated to be low.

Therefore, for reasons stated above, the exception can apply to this criterion.

#### Criterion 14

Federal lands which are high priority habitat for migratory bird species of high federal interest on a regional or national basis, as determined jointly by the surface management agency and the Fish and Wildlife Service, shall be considered unsuitable.

1. Exception. A lease may be issued where the surface management agency, after consultation with the Fish and Wildlife Service, determines that all or certain stipulated methods of coal mining will not adversely affect the migratory bird habitat during the periods when such habitat is used by the species.

#### Analysis

Of the 278 breeding bird species in Colorado, 65 priority species in 15 major habitats and three physiographic areas are addressed in the Colorado Bird Conservation Plan. The project area is within the Southern Rocky Mountains Physiographic Province (62), and several priority habitats are present within or immediately adjacent to the lease modification area. These habitats and associated high priority species include:

Aspen: broad-tailed hummingbird, red-naped sapsucker, purple martin, violet-green swallow;

Cliff/Rock: peregrine falcon, black swift;

High elevation riparian: Cordilleran flycatcher, American dipper, McGillivray's warbler, Wilson's warbler;

Low elevation riparian: Lewis' woodpecker, lazuli bunting;

Mixed conifer: blue (currently dusky) grouse, Williamson's sapsucker;

Mountain shrubland: Virginia's warbler, green-tailed towhee;

Spruce-fir: boreal owl, olive-sided flycatcher, Hammond's flycatcher.

Many of these species are known or suspected to be present in the project area. In addition, the flammulated owl is listed as a ponderosa pine species in the plan. However, it is known to use aspen in this area. Implementation of the proposed action "may impact individuals or habitat, but will not likely contribute to a trend towards federal listing".

Stipulations on the parent lease, which will apply to the lease modification, require avoidance of certain habitats of breeding and neotropical birds:

- If there is reason to believe that new individuals or populations of Threatened or Endangered, or Sensitive Species or plants or animals, or migratory bird species of high federal interest occur in the area, the lessee shall be required to conduct an intensive field inventory of the area to be disturbed and/or impacted....

Therefore, for reasons stated above, the exception can apply to this criterion.

#### Criterion 15

Federal lands which the surface management agency and the state jointly agree are habitat for resident species of fish, wildlife and plants of high interest to the state and which are essential for maintaining these priority wildlife and plant species shall be considered unsuitable. Examples of such lands which serve a critical function for the species involved include: (i) active dancing and strutting grounds for sage grouse, sharp-tailed grouse, and prairie chicken, (ii) winter ranges crucial for deer, antelope, and elk, (iii) migration corridor for elk, and (iv) extremes of range for plant species.

1. Exception. A lease may be issued if, after consultation with the state, the surface management agency determines that all or certain stipulated methods of coal mining will not have a significant long-term impact on the species being protected.

#### Analysis

There are no known habitats for sage grouse, sharp-tailed grouse, or prairie chickens in this area. The area contains winter range for deer and elk, but due to its elevation is not critical winter range. Elk do migrate through this area from higher elevations to winter range in the valley, but it is not delineated as a corridor by CDOW. This area may be at the extreme range for plant species but there are no known populations of threatened, endangered, or Forest Service Sensitive plants in this area. Therefore, for reasons stated above, the exception can apply to this criterion.

#### Criterion 16

Federal lands in riverine, coastal, and special floodplains (100-year recurrence interval) on which the surface management agency determines that mining could not be undertaken without substantial threat of loss of life or property shall be considered unsuitable for all or certain stipulated methods of coal mining.

#### Analysis

The application lands are not within a riverine, coastal or special floodplain.

#### Criterion 17

Federal lands which have been committed by the surface management agency to use as municipal watersheds shall be considered unsuitable.

#### Analysis

None of the lands in the proposed lease tract are within a municipal watershed.

#### Criterion 18

Federal lands with National Resource Waters, as identified by states in their water quality management plans, and a buffer zone of federal lands ¼-mile from the outer edge of the far banks of the water, shall be unsuitable.

#### Analysis

None of the lands in the proposed lease tract are identified as a National Resource Water.

#### Criterion 19

Federal lands identified by the surface management agency, in consultation with the state in which they are located, as alluvial valley floors according to the definition in Subpart 3400.0-5(a) of this title, the standards of 30 CFR Part 822, the final alluvial floor guidelines of the Office of Surface Mining Reclamation and Enforcement when published, and approved state programs under the Surface Mining Control and Reclamation Act of 1977, where mining would interrupt, discontinue, or preclude farming, shall be considered unsuitable. Additionally, when mining federal land outside an alluvial valley floor would materially damage the quantity or quality of water in surface or underground water systems that would supply alluvial valley floors, the land shall be considered unsuitable.

#### Analysis

The application lands are not within an alluvial valley floor, but such lands drain into the North Fork Gunnison River, along which, both surface irrigated and potentially irrigable sites exist. Within the lease modification boundary, no water facilities (reservoirs, ditches, diversions) exist.

Changes in ground slope and creation of tension cracks can alter surface hydrology and soil erosion processes. Increased surface erosion, debris flows and disruption of drainage pattern and flow in streams have been documented (Sidle, et al. 2000). Effects to stream channels include (1) increase in lengths of cascades and to a lesser extent glides; (2) increases in pool length, numbers and volumes; (3) increase in median particle diameter of bed sediment in pools; and (4) some constriction in channel geometry. The magnitude of these effects varies depending upon the amount and location of subsidence.

Increased sediment delivery will affect water quality in Hubbard Creek (e.g. increased sediment load). This section of Hubbard Creek already receives large amounts of sediment from the erosive soils in the vicinity during normal precipitation and runoff (D. Garrison, pers. obs.) so effects of increased sedimentation may not be quantifiable beyond baseline levels.

Subsidence is also predicted to occur within 1000 feet, and in some areas less than 600 feet of Hubbard Creek. Increased surface erosion, changes to stream morphology and possible disruption of streamflows could occur as a result. Disruption of stream flow is also a possibility, but since subsidence is not expected in the vicinity of the floodplain or stream channel there is a low probability of occurrence. Again, since this portion of Hubbard Creek already receives large amount of sediment, quantification of additional

effects from sedimentation beyond baseline is difficult. The magnitude and duration of predicted effects depends upon the amount and location of subsidence.

Although material damage to the quality and quantity water arising on or flowing over the proposed lease modification is possible, because of the reason listed above, this is not anticipated, and would be hard to separate from natural process that are currently affecting water quality/quantity.

Therefore, for reasons stated above, the exception can apply to this criterion.

#### Criterion 20

Federal lands in a state to which is applicable a criterion (i) proposed by the state or Indian tribe located in the planning area, and (ii) adopted by rulemaking by the Secretary, shall be considered unsuitable.

#### Analysis

This criterion is not presently in effect in the State of Colorado.

### **REFERENCES**

Colorado Division of Wildlife GIS data <http://ndis.nrel.colostate.edu/ftp/index.html>

Partners in Flight 2000. Landbird Conservation Plan Colorado. Estes Park, CO. Available <http://www.blm.gov/wildlife/plan/pl-co-10.pdf>

Pfister, Allan R. (USFWS Grand Junction Office) 2007. Programmatic Biological Opinion for Water Depletions on the GMUG National Forest. May 25, 2005, amended April 27, 2007 - #ES/GJ-6\_CO-99-F-033-CP062.

Ruediger, Bill, et.al. 2000. Canada Lynx Conservation Assessment and Strategy. USDA Forest Service, USDI Fish and Wildlife Service, USDI Bureau of Land Management, and USDI National Park Service. Forest Service Publication #R1-00-53, Missoula, Montana.

USDA Forest Service 2008. Biological Evaluation and Management Indicator Species Assessment for Bowie Coal Lease Projects. Delta, CO. 30 April.

USDA Forest Service 2008a. Biological Assessment for Bowie Coal Lease Projects. Delta, CO. 28 April.

U.S. Department of The Interior, 1983, Uinta-Southwestern Utah Coal Region Environmental Impact Statement, U. S. Department of the Interior, Bureau of Land Management, Utah State Office, Salt Lake City, Utah.

\_\_\_\_\_. 2000. Final Environmental Impact Statement, Iron Point Exploration License, Iron Point Coal Lease Tract, Elk Creek Coal Lease Tract, Delta and Gunnison Counties, Colorado, February 2000. USDA Forest Service, Paonia, Colorado, and USDI, BLM Montrose, Colorado.

U.S. Fish and Wildlife Service, 2008. Western Colorado Suboffice, Grand Junction, CO. Updated Species List.

Other references in the Biological Assessment and Biological Evaluation for the project.



## **CONSULTATION AND COORDINATION**

The following agencies and organizations were contacted to gain information pertinent to the application of the 20 coal suitability criteria:

### **Federal Agencies**

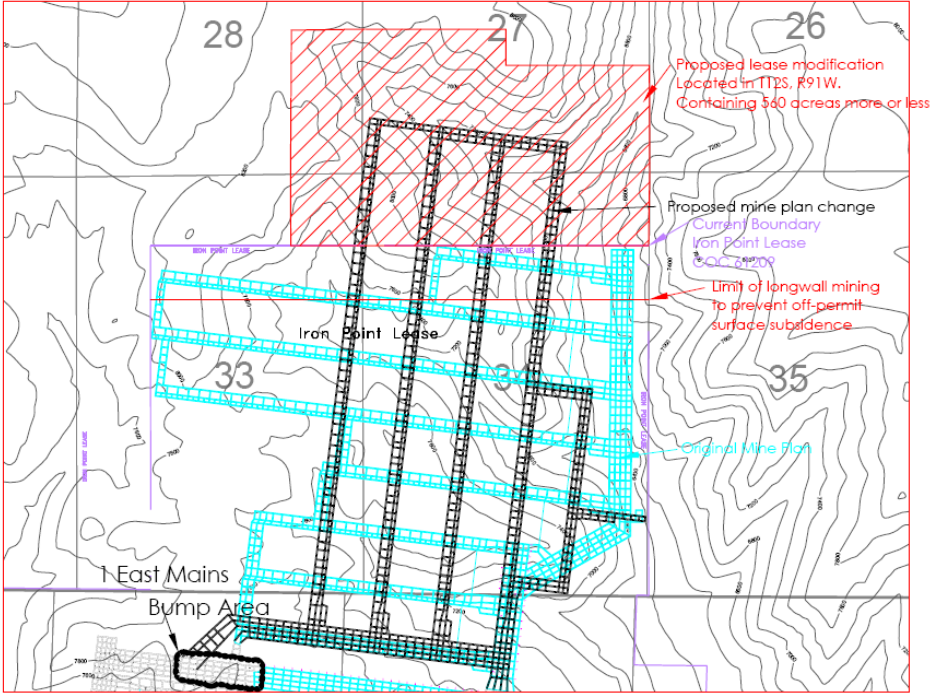
U.S. Department of Interior  
Fish and Wildlife Service  
Western Colorado Suboffice  
529 25 1/2 Road  
Grand Junction, CO 81505-6199

### **Colorado State Agencies**

Division of Wildlife, Southwest Region Office, Gunnison, CO.



# APPENDIX B- MAP OF RE-ORIENTED PANELS





## APPENDIX C- GER/MER

Combined  
Geologic and Engineering Report (GER)  
and  
Maximum Economic Recovery Report (MER)  
for  
Coal Lease Modification No. 3 (No. 4 technically)  
To the  
Iron Point Tract (COC 61209)  
applied for by  
Bowie Resources Ltd. (BRL) November 2007  
T.12S., R.91W. 6th Principal Meridian  
by  
Desty Dyer  
Mining Engineer  
February 2008 GER / MER Report - Iron Point Coal Lease  
Modification #3 Application - BRL

## LOCATION

The legal description for the third Iron Point lease modification is as follows:

T.12S. R.91W., 6th Principal Meridian.

Sec. 27: SW<sup>1</sup>/<sub>4</sub>, S<sup>1</sup>/<sub>2</sub>SE<sup>1</sup>/<sub>4</sub>, S<sup>1</sup>/<sub>2</sub>NE<sup>1</sup>/<sub>4</sub>SE<sup>1</sup>/<sub>4</sub>, S<sup>1</sup>/<sub>2</sub>NW<sup>1</sup>/<sub>4</sub>SE<sup>1</sup>/<sub>4</sub>;

Sec. 28: E<sup>1</sup>/<sub>2</sub>SE<sup>1</sup>/<sub>4</sub>;

Sec. 33: NE<sup>1</sup>/<sub>4</sub>NE<sup>1</sup>/<sub>4</sub>;

Sec. 34: N<sup>1</sup>/<sub>2</sub>N<sup>1</sup>/<sub>2</sub>

Consisting of approximately 560 acres located on lands managed by the BLM for minerals and the USFS for federal surface.

Note: The third Iron Point lease modification will be referred to hereafter as the IPM3.

The Bowie No. 2 Mine is located in Delta County, Colorado, 5 miles north-northeast of Paonia off of highway 133. The mine accesses coal reserves in the BRL fee holdings and federal coal reserves within coal lease COC61209. The projected mine plan portrays eventual access to federal coal reserves in lease C-37210 (LMU COC57202), also held by BRL.

## STRATIGRAPHY

**GENERAL** - The Bowie No. 2 Mine is located in the Paonia coal field on the Southern flank of the Piceance Creek structural and sedimentary basin. The area is bounded by Larimide structural and physiographic features as follows: On the East by West Elk and Elk mountains; on the South by the Gunnison Uplift; on the West-SW by the Uncompaghe Uplift; and on the North by the Grand Mesa-Piceance Basin. The local structure dips 4 to 7 degrees NE with minor rolls and faults offsetting this trend in certain areas.

**COAL BEDS** - Coal in the Paonia field is found as six identified seams (generally by alphabet starting with A as the lowest seam) within the Mesaverde Group of late Cretaceous age. In the mine permit area, only the B and D seams have hosted producing mines. Within the IPM3, the A and C seams are not of mineable thickness, the D-Seam is split into three thin seams. An intrusive sill has burned or coked up to half the Lower B-Seam leaving only a portion that may be mineable; however, the upper and lower B-Seam average interburden of 35 feet may not allow mining the lower seam after mining the upper seam. The E and F-Seams are not of mineable thickness. Both B seam splits have ten to twelve feet of mineable thickness and good quality; however, only the upper split is projected to be mined on the IPM3 due to intrusive sill as noted above.

**COAL QUALITY** - The B-Seam coal is high volatile C bituminous with an “as received” analysis for the moisture, ash, sulphur, and BTU content based on drill hole samples expected to be approximately:

Moisture 6.93 %

Ash 7.98%

Sulphur 0.50%

BTU 11,997

These reserves can meet compliance coal standards for sulfur and ash content for markets currently supplied by BRL. A wash plant owned by BRL is available to mitigate any non-

compliance coal should either in-seam or mining related dilution lower the compliance of the mined product.

## **MINING FACTORS**

**METHOD CONSTRAINTS** - Geologic constraints relating to coal depth and thickness within the IPM3, and economic constraints and equipment availability for the applicant dictate that the underground longwall method be employed to extract the coal from the IPM3. The amount of overburden on the IPM3 varies from approximately 1,200 ft. to 2,000 ft. over the Upper B-Seam, and averages about 1,600 ft. This overburden necessitates underground mining and since BRL already owns underground longwall mining equipment, they would employ it to mine the coal reserves.

## **PRODUCTION FACTORS**

**CURRENT**- Short Term Schedule - Production to meet the market demand is supplied by three active development sections and one longwall section. As of December 2007 the fee reserves were depleted so that all future production is expected to come from federal coal. The sections are scheduled to work on daily rotating shifts with a monthly schedule totaling about 1500 operating shifts per year. As the COC61209 reserves are depleted, the workings will proceed to the C-37210 federal lease (COC57202 LMU).

**PRODUCTION DATA** - The current operation completed mining of the D-Seam in March 2005, and transitioned to the Bowie No. 2 Mine B-Seam portals and workings. BRL successfully mines coal using the longwall method of mining by developing longwall blocks using continuous miners. Mains and gateroads are developed ahead of longwall mining to allow a longwall move about every six to nine months. Recovery overall is about 60% with a rate of mining at about 5 million tons per year. BRL intends to maintain a production rate of 5 to 6 million tpy in order to meet financial cash flow demands for the operation.

Projected with IPM3- Short Term Schedule - BRL management would maintain the current production schedule they have in the operations of the Bowie No. 2 mine.

**MINING EQUIPMENT** - The following is a list of major equipment currently used by BRL and is typical for use in an underground longwall operation:

- Continuous Miners 3
- Roof Bolters 3
- Shuttle Cars 9
- Utility Scoops 2
- Utility Haulers 2
- Utility Mantrips 4
- Shield Puller 1
- 60" Belt Drives 9
- Shield Hauler 2
- Shearer 1
- Face Shields & Pans 180 (30 spares)
- Main Mine Fan 1 (with 1 additional during life of mine)

There would be no change.

The operation would extract coal from B coal seams. Panel geometry and recovery would change to N-S on the remaining area in the COC61209 lease.

**LIFE OF MINE** - The B-Seam (combined upper and lower) recoverable reserves currently known to be available to the Bowie No. 2 mine operation on the COC61209 lease total about 11.96 million tons of federal coal with a mine plan orienting remaining COC61209 LW panels about N-S. There is potential for more recoverable reserves on current lease holdings in their suspended LMU totaling about 10.54 million tons. The IPM3 would add about 2.78 million tons bringing the grand total to about 25.28 million tons. There is also potential recoverable reserves on unleased federal coal to the north that is expected to be explored over the next two years. At the projected 5 million tpy production rate the life of mine would be about 5 years with potential for an estimated 5 additional years if more reserves are proven.

The existing combined federal holdings represent about 5 years of mine life. The IPM3 would add only about 2.78 million tons of B-Seam recoverable reserves, but would also serve to allow revised panel layout such that recovery on the north side of federal lease COC61209 could be optimized. Although this adds about one-half year to the life-of-mine, it is a welcome consequence better than bypassing available reserves. Actual years of operations on the IPM3 could last over an extended time since coal production from the adjacent federal coal leases could be realized in conjunction with production from the IPM3. Mining in the IPM3 and in the adjacent properties could take 5 years (Mine Life), but it is likely that the IPM3 itself will be mostly mined-out about one year after being entered.

**MANPOWER** - The current manpower level averages about 255.

The manpower requirements would remain the same at about 215 employees.

## **SURFACE FACILITIES**

The current surface coal handling facilities of the BRL mining operation located on Bowie fee surface would serve the needs of the operation even with additional coal leased as proposed in the IPM3 as applied for by BRL.

## **TRANSPORTATION**

The current transportation infrastructure at the Bowie No. 2 mine would serve the mining needs of the operation even with the addition of the IPM3. There is a conveyor belt system in place from the train load-out to the current working area underground. This system could be extended to working faces in the IPM3.

## **ESTIMATED RECOVERY**

The B-Seam recovery within the IPM3 should be that for underground longwall taking nearly full seam height in the LW block and about 9' in development calculated to be 78%. Because there would be more LW to development area mined, this recovery is about 10% higher than overall mine recovery which is about 65% of mineable reserves. The existence of an intrusive sill in the Upper B-Seam could render a portion of the IPM3 B-Seam unmineable or just partially recoverable but there is also a chance that one or two blocks may be extended longer.



B-Seam recovery will be enhanced on federal coal lease COC61209 with the addition of the IPM3 by facilitating longer blocks crossing the current north boundary. If the blocks were terminated at the current boundary BLM calculates the recovery of the B-Seam on COC61209 would be diminished by about 137,000 tons.

## **POTENTIAL MARKETS**

The current Bowie No. 2 mine primarily supplies coal for electric power plants. The approximate breakdown of market destinations for the coal is shown below:

1. Electric Utilities (TVA and others) 95-98%
2. Manufacturing Plants (Coke, cement, etc.) 2 - 5%

## **MAXIMUM ECONOMIC RECOVERY DETERMINATION**

The IPM3 area BRL applied for has been determined by availability of mineable coal (constrained by projected quality, surface protection of Terror Reservoir & Hubbard Creek, and adjacent federal holdings). It is located in such a way as to allow the Bowie No. 2 mine access to a modest portion of federal coal reserves which in turn allows better mine orientation to remaining federal coal currently held by BRL. Although neighboring coal companies exist in the proximity, there is no indication of interest in the IPM3. It is not possible that a third party would deem the coal resource in the IPM3 either substantial or valuable enough for them to initiate new surface and underground facilities.

It has been determined by BLM that Maximum Economic Recovery (MER) of the IPM3 federal lease application can be achieved by underground mining using the longwall method of mining as described above.